

### PRACTICAL ESSAYS

ON

### AGRICULTURE:

#### CONTAINING

An Account of Soils, and the Manner of correcting them.

An Account of the Culture of all Field Plants, including the Artificial Grasses, according to the Old and New Modes of Husbandry, with every Improvement down to the present Period.

Also, An Account of the Culture and Management of Grass-Lands; together with Observations on Enclosures, Fences, Farms, and Farm-Houses, &c.

CAREFULLY COLLECTED AND DIGESTED FROM THE MOST EMINENT AUTHORS, WITH EXPERIMENTAL REMARKS,

By JAMES ADAM, Esq.

### VOL. H.

Majores nostri, virum bonum cum laudabant, ita landabant, bonum agricolam, bonumque colonum; amplissime laudari existimabatur, qui ita laudabatur. Caro, De Re Rustice, Lib. L.

LONDON:

PRINTED FOR T. CADELL, IN THE STRAND. .. M.DCC.LXXXIX.

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Page 12, line 11, for farinageous read farinaceous.

- 49, 10, for bows read boughs.
- 235, 7, for thus read juft.
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Indiamon Of POTATOES. 10 30 4 45

In this excellent root, which was first brought into Europe from America, by Sir Walter Raleigh, we have a vast advantage over the ancients, who certainly knew it not. That great officer, in his return home, stopping in Ireland, distributed quantities of these roots, which being of

Potatoe is evidently a corruption of the Indian name basata.

Vol. II. B very

very easy cultivation, soon multiplied exceedingly in that country; insomuch that in the wars which were afterwards carried on there, when all the corn above ground was destroyed, potatoes became the chief support of the people. The Philosophical Transactions observe likewise, that the Irish were relieved, by the help of this root, from their last severe famine, which continued for two years, during which all their own corn failed. From Ireland it came next into Lancashire, now famous for its potatoes; and within these last sifty years, the culture of this very useful plant has been extended to every county in Great-Britain.

Mr. Miller distinguishes only two general varieties of these plants; the red rooted, which carry purplish flowers, and the white rooted, which bear white flowers.

The Irish husbandman blames the English, for planting this root uncut; because it often contains five or six eyes, or perhaps more, from which the produce of the ensuing year is to spring; and also, for not allowing that bulb, or rather, the greater number of shoots and bulbs that proceed from it, a space of earth sufficient for their nourishment; which is the reason why so many poor, stunted, unserviceable potatoes, are dug up in the autumn. The practice in Ireland is, to choose middle-sized roots, for the largest are generally

made use of for the table; then, to single out the eyes that seem strongest and most vigorous, and to cut them out in squares of at least half an inch every way: so that one root will sometimes surnish three or sour good pieces to set.

The ground, prepared for planting, is marked out for beds four or five feet wide, with intermediate alleys of two or three feet wide. It is then trenched, only a fingle fpit deep, and the bottom of this trench, made as in common garden trenching, is covered with dung, long and short, taken out of a wheel-barrow which stands at the labourer's elbow. The potatoe-eyes, cut as before directed, are placed upon this dung, at about five or fix inches afunder; and this trench is filled with the mould taken out of the next, which is marked by a line at the distance of two or three feet. This trench is again filled with the mould of the next, and fo on to the last, which is filled from the alley. The use of the dung thus laid at the bottom of the trenches is, not only to make the roots grow fingle, for not above one root, or two at most, will in this case be produced by each eye, and these will be large, and well fed; but it is attended with the farther advantage of making the potatoes run, and spread themselves to a certain determinate depth; which is no small help to their growing large.

B 2

These sets are planted in February or March, and in April or May. As soon as they begin to rise, the earth must be dug out of the alleys, as is done for asparagus, and the potatoe-bed is covered with it, about five or six inches deep. This will give new life and vigour to the roots, will keep the green from running too much to haulm, and will make the bulbs grow much the larger. By these means the crop of fine large potatoes will be almost double what is obtained when they are planted promiscuously in the common way: nor will any farther culture be requisite, till they are fit to be dug up, except the pulling up of the largest weeds.

Mr. Miller's reasons for disapproving of planting either the small off-sets entire, or the eyes cut out of the larger roots, are, that though the former generally produce a greater number of roots, these roots are always small; and that the cuttings of the larger roots are apt to rot, especially if wet weather happens foon after they are planted. He therefore recommends, to make choice of the fairest roots for fetting, and to allow them a larger space of ground, both between the rows, and between the plants in the rows; and he affures us that he has observed, when this method has been followed, that the roots in general have been large the following autumn. M. du Hamel, in his 

his Elements of Agriculture, does not at all object to the planting of the cuttings.

The soil in which this plant thrives best is, a light fandy loam, heither too dry nor too moist, but brought to a fine tilth, and ploughed deep; for the deeper the earth is loosened, the finer and larger the roots will grow.

Mr. Miller fays, that in the spring, just before the last plowing, a good quantity of rotten dung should be spread on the ground, and this should be plowed in early in March, if the season be mild; otherwise, it should be deferred till the middle or end of that month: for if a hard frost comes on soon after the roots are planted, they may be greatly injured.

The last plowing should lay the field even, and then surrows should be drawn three seet asunder, and seven or eight inches deep. The roots should be laid at the bottom of these surrows, about one foot and a half asunder; and they should be then covered with earth. After all the ground is planted in this manner, and when the shoots are expected to appear, then it should be well harrowed both ways, as well to loosen the surface, as to tear up the young weeds, which will have begun to grow by that time,

Mr. Miller places the rows at three feet diftance, in order to introduce the horse-hoc between olderabit B 3 them, them, as that will greatly improve the roots; for by twice stirring and breaking of the ground between these plants, not only weeds will be destroyed, but the soil will be so loosened, that every shower of rain will penetrate to the roots, and greatly quicken their growth. But these operations should be performed early in the season. The first horse-hoeing should be given when the plants are about five or six inches high; and the second, when they are about twelve or sisteen; and at each of these, the rows should be earthed up; but with care not to cover any of their stalks.

As these horse-hoeings can only destroy the weeds between the rows, it will be necessary to use the hand-hoe, to stir the ground and destroy the weeds in the rows, between the plants. If this be well done in dry weather, it will be sufficient to keep the ground clean until the potatoes are sit to be taken up; which will be very soon after the first frost in autumn has killed the haulm.

They should not remain much longer in the earth, lest the roots themselves be frost-bitten, which spoils them. A four or five-pronged fork is better to dig them up with than a spade, because it is less apt to cut them; but a principal thing to be considered in this is, the clearing of the ground; for if any are lest, they will shoot up among the new crop, whatever it be, and do considerable

fiderable damage, especially if it be wheat sown broad-cast.

If the farmer apprehends that his land has not been thoroughly cleared of the potatoes, and is therefore afraid of their hurting the enfuing crop; his best way will be to lay it up very rough, against winter; because the frosts of that season are known to kill and rot all potatoes in the ground, which are exposed to them; and it will at the same time be thereby finally prepared for spring corn; especially as it will have been well enriched, by the haulm of the potatoes lying upon it.

Though potatoes delight most in a light sandy soil; yet Mr. Maxwell says, that he has seen them thrive well on ground that seemed very bad; even in deep bog or moss, which could not bear horses to plough it, but is considerably bettered by them; and on coarse heath, where they were succeeded by grain, without more dung than was laid on at first. Of so improving a nature are they, and so much is the land enriched by the rotting of their stalks among it, and the digging it gets in raising them.

Mr. Higfon, a correspondent of the Bath Society, says, that ground for potatoes should be well manured with rotten horse-dung, and the seed changed every year. They should also be planted in fresh ground every year; for if either

fresh, or the same seed, be planted in the same soil, two or three years successively, the crops will in general fail, the haulm come up curled and blighted, and the roots will be worm-eaten and cankered.

Potatoes should not be planted deeper than four inches, or four inches and a half, and the seed or fets should be one inch or one inch and a half above the dung. Whole potatoes should be planted at the distance of two seet and a half, or three feet square. Mr. Higson has often seen potatoes planted upon ground without dung, ten or twelve inches deep. But these crops have always failed, as he supposes, for want of proper nourishment.

He tried the following experiment for five years successively. The first year, on the same day, and in the same ground, he planted whole potatoes in ranks, at the distance of three seer square; and cuts of the same kind, at eighteen inches square. During the last four years, he planted whole potatoes at the distance of two seet and a half square, and cuts at eighteen inches.

The whole fets were earthed up three or fourtimes; that is, as long as the haulm would fland; and a few ranks of the cuts were earthed up also. The whole-fets always produced a greater crop than the cuts, in proportion to the quantity of ground; and the potatoes were larger and fairer. He observed little or no difference in the produce of the cuts, whether the ranks were earthed up or not, which he accounts for thus, that the wholefets having fresh mould drawn up to them on all sides, have a large space round them; but the cuts having a small space round them, were but poorly supplied.

Mr. Higfon mentions a small white fort of potatoe, cultivated of late years at Altringham in Cheshire. This they plant in January, or as soon as the earth is dry and the weather mild. This species never blows; but is fit for use a month or fix weeks sooner than any other kind. He has known the following experiment tried with good success. The above species has been planted in October, and if there comes hard frost without snow, they cover the potatoes with pea-haulm, bean-haulm, straw, or other light covering. The whole crop is dug up in May, and another crop immediately put in; which is also dug up in October following. He has himself daten new potatoes thus raised, in April.\*

The Norfolk Agricultural Society gave a premium to Mr. Wright of Great Melton, for plantaing and gathering the best crop of potatoes; the quantity of land being one rood, and the produce ninety-one bushels. On that occasion, the Society greatly recommend the culture of this most

o a Thank Suc. Tanf. Vol. I. p. 28.

valuable root; not only for its being an excellent and wholesome sood, in various modes of application, but is besides well known to make a sweet and nourishing bread, when mixed in equal quantities with the flour of wheat; and they add, that they think it almost unnecessary to observe on that subject, what every intelligent farmer is already apprised of, that as good a crop of wheat may be expected after well cultivated potatoes, as in any other mode of husbandry.

Calculation for cultivating one acre of land with potatoes according to Mr. Wright's expences, and the valuation of his crop. Seed, thirty-two bushels at one shilling per bushel ...... 1 12 0 Manure, twenty-four loads, at two shillings per load ...... 2 8 0 Expence of fetting in dry weather, at ...... Hoeing and earthing up feveral times . 1 0 0 Expence of taking up ..... 5 8 0 Rent and other charges ...... 1 10 0 ally in contributed to the contribute the £13 Produce, three hundred and fixty-four bushels, at one shilling per bushel . 18 Clear profit £5 2 0 valuable It

It should here be observed, that only one half of the expence of manure ought properly to be charged to the potatoes; as the land remains in fine order for any succeeding crop.

One shilling per bushel is the price on the spot, and therefore no expence of carriage is stated.

The price stated for taking up the crop appeared so extraordinary to the Bath Society, that they ordered their Secretary to enquire the meaning of it; and he was informed, that in order to have the crop taken off perfectly clean, Mr. Wright had all his ground ridged up: that he had also had all his crop picked over, and separated into different sorts, which had taken up a considerable time, and occasioned an extra expence.

But an acre of potatoes, producing three hundred and fixty-four bushels, may probably be taken up in the usual way, for about half the expence above stated; and half the expence of manure being deducted, the neat profit of an acre thus cultivated, and producing such a crop, would be at least nine pounds.

When I consider the great utility of this most excellent root, which affords so much nourishment to men, to all forts of cattle, and even to poultry, I cannot too strongly recommend the culture of it.

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The best way of keeping potatoes, during winter is, to lay them in a dry place, in very dry fand, or in fine dry earth.

If horses eat potatoes reluctantly at first, they may be easily broke in to it, by mixing with them two or three times some marshmallows, of which they are extremely fond.

When given to cows, oxen, or hogs, they are much improved, by being thrown into an oven, after baking of bread, and there dried: this renders them much more farinageous and more fattening; the cold raw fap being thereby exhausted; but if this cannot be conveniently done, they must be given raw to the cattle: and for hogs they may be boiled, and mixed with their other trough-meat, such as pollard, barley-meal and pease; for though hogs will eat them raw, yet they are much more fattening when boiled: and there is nothing they devour with more eagerness, than such a mess as I have described.

If potatoes were introduced regulary in the farmer's course of crops, nothing perhaps would answer better: the land, by means of their culture would be brought into fine order; and I should think he might save himself the trouble and expence of cleaning the ground after them, by only gathering the best of the crop and turning in his hogs to glean the remaining part; by which means

means the hogs would be fattened, the field would be richly manured with their dung, and the formidable article of taking up, above flated by Mr. Wright, would be almost wholly saved.

Nothing is more interesting to a farmer, or clears up his ideas more, than actual statements of the expence and produce of any crop: I shall therefore transcribe from the Transactions of the Bath Society, an account of the culture and produce of six acres of land, of about twenty shillings value per acre, by John Billingsley Esq; who says, that in the year 1781 this field was in grass, an old turf that had not been plowed for more than twenty years.

Carry over £10 1 0
Getting

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"Linear Different about Brought over \$10 1 0
Getting in, threshing, &c. and winnow-
ing, at one shilling and fix-pence per
quarter
Rent
Tithe 0 12 0
Sundry expences, fuch as highways, &c. o 6 o
Total expence £19 4 0
appropriate solution prior to the capture (\$190,400)
equilibility the same that Produce, if to extend the reals
Thirty quarters of oats, at twenty-fix
shillings per quarter
N. B. Some fold at thirty-two shil-
lings.
Ten loads of straw at twelve shillings 6 o o
20 Mai xil ord toris toris
Deduct expences as above 19 4 0
o o grant acre
o si a she roll brin oroll in Profit 25 16 0
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It should be remarked, that this great profit arises, principally, from the uncommon price of oats; which, though fold this year for near thirty shillings, are usually fold for sourceen or sisteen shillings per quarter.

Second year, 1783, Potatoes.
November 3, 1782, Plowing the oat
stubble, at four shillings
March 7, 1783, Another plowing, at
four shillings 1 4 0
March 25, Harrowing, at two shillings 0 12 0
Thirty cart-loads of dung per acre, at
three shillings per load, hauling in-
cluded27 0 0
April 27, Began planting, and finished
May 25, in beds eight feet wide, and
the alleys two feet and a half wide:
placed the fets at one foot distance on
the fallow, then spread the dung on
them, after which they were covered
three or four inches deep with earth
from the alleys, at twenty-fix shillings
per acre
Seed from Dumfries in Scotland (very
high price), five facks to an acre, at
fourteen shillings
June 15, Hoeing, at fix shillings 1 16 0
Aug. 3, Hand-weeding at four shillings 1 4 0
Oct. 18, Digging up at forty shillings
per acre
Hauling, pitting, thatching, &c 4 0 0
Tythe
Carry over £79 6 a
Rent

. Brought over 279 6 o
Rent
Sundries
Total £85 12 0
Was to the second of the secon
o set o equilim Produce quoralt , se monde
Best potatoes, five hundred and fifty his stand i
facks, of 240lb. at four thillings 110 0 0
Middling ditto, one hundred facks, at
three shillings and sixpence
Small ditto, fifty facks, at two shillings
offe des two feet and a half Sonogxil bns
paced the fees as whe foot diffance on since
o 21 884 w, lines spread the dung on
Deduct expenses, as above 85 12 0
o der 844 our inches deep with earth
now the alleys, at twenty, by thillings

Which is upwards of eight pounds profit per acre, and the land left in excellent order for wheat\*.

The Rev. Mr. Close, of Trimley, Suffolk, after recommending much the culture of this admirable root, gives us his method of cultivating it, by first pulverizing well by two or three plowings and harrowings, after which he manures with fifteen or twenty cart-loads of dung per acre, before it receives its last earth. Then it is thrown on to what the Suffolk farmers call the trench-balk, which is narrow and deep ridge-work, about

fifteen

d ery Bath Sec. Tranf. Vol. MI. p. 109.

Momen and children drop the fets in the bottom of every furrow, fifteen inches apart; men follow, and cover them with large hoes, a foot in width, pulling the mould down, so as to bury the fets five inches deep; they must receive two or three hand-hoeings, and be kept free from weeds; always observing to draw the earth as much as possible to the stems of the young plants. After repeated trials, the second week of April is sound to be the most advantageous season for planting.

In the end of September, or beginning of October, when the haulm becomes withered, they should be plowed up with a strong double-breasted plough. The workman must fet his plough deep, to avoid hurting the crop. The women who pick them up, if not carefully attended to, will leave many in the ground, which will prove detrimental; and should be prevented by harrowing the land, and turning in the swine to glean the few that may be left.

By this method, the fets will be fifteen square inches from each other; it will take eighteen bushels to plant an acre; and the produce, if on a good mixed loamy soil, will amount to three hundred bushels.

If the potatoes are grown as a preparation for wheat, it would be better to have the rows two Vol. II.

1991

feet two inches apart, hand-hoeing only the space from plant to plant in each row; then turning a small surrow from the inside of each row, by a common light plough; and afterwards, with a double-breasted plough, and one horse, split the ridge in the middle of the interval, which will destroy the weeds, and earth up the plants. This work should not be done too deep the first time, to avoid burying the tender plants; but the last earth should be plowed as deep as possible; and the closer the mould is laid to the stems of the plants, the more advantageous it will prove.

Thus, fifteen bushels will plant an acre, and the produce will be still about three hundred bushels; but the land, by the summer-plowings, will be prepared to receive seed-wheat immediately, and almost insure a plentiful crop.

If potatoe fets are used, they should becut a week before planting, with one or two eyes to each, and the pieces not very small. If two bushels of fresh slacked lime were sown over the surface of the land, as soon as planted, it would effectually prevent the attacks of the grub.

The expence attending an acre of potatocs well cultivated in the first method, supposing the rent twenty shillings, tythe and town charges rather high (as in Suffolk), taking up, and every thing included,

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included, will be about fix pounds. In the last method it would be formewhat reduced.

Mr. Close for many years fold the greatest part of his crop, at feven shillings per fack of three bushels: then one hundred facks would amount to thirty-five pounds; but they are now fo much cultivated, that, to make a fure estimate, they should be valued only as applicable to the feeding and fattening of cattle.

He fays from experience, they are worth three shillings per fack, for these purposes, and then the produce as above would amount to fifteen pounds per acre.

They are excellent food for hogs; roafting pork is never fo moist and delicate as when fed with potatoes, and killed from the barn-door, without any confinement. For bacon and hams, two bushels of pea-meal should be well incorporated with four bushels of boiled potatoes; which quantity will fat a hog of twelve stone (fourteen pound to the stone). Cows are particularly fond of them; half a bushel at night, and the same quantity in the morning, with a fmall allowance of hav, is fufficient to keep three cows in full milk: they will yield as good and as fweet butter as the best grafs.

Mr. Close adds, that in fattening cattle, he gives them as much as they will eat: a beast of about vilno.

thirty-five stone will require a bushel per day, but will fatten one third sooner than on turnips.

The potatoes should be clean washed, and not given till dry: they do not require boiling for any purpose but fattening hogs for bacon, or poultry, which last eat them greedily. He prefers the champion to any other fort he ever cultivated. With him, they did not answer so well as he expected for horses, though some gentlemen have approved of them as substitutes for oats.

When predilections for old customs are subdued, Mr. Close hopes to see the potatoe admitted in the constant course of crops, by every spirited husbandman; and thinks the most beneficial effects would acrue from such a system. Mr. Close says, very sensibly, that they are a most valuable article for the poor; who, in his neighbourhood, partly maintain themselves, and feed their children, upon them. They are excellent substitutes for peas in broths, and make a very useful ingredient in a cheap stew for the common working people.\*

With all these advantages, it is not possible to recommend the culture of them too much; for where these are in plenty, the poor can never be said to want food. Indeed, I do not know whether this plant and the Jesuits bark, be not the

Lond. Soc. Tranf. Vol. III. p. 111.

only benefits that Europe has ever gained by the discovery of the western world.

Wherever there feems to be an exact account given of expences and produce, I am always defirous to infert it. I shall therefore add the following, from the Bath Society's Transactions.

The field was four acres and a half, the foil very poor, being light, loofe, and fandy; worth about ten shillings per acre, and had been down in grass two years. In January, ten waggon-loads of dung per acre, were carried over it; and the following month it was folded over, and plowed as deep as the ground would bear, then harrowed smooth.

The potatoes were planted in March, eighteen bushels per acre, cut in two, three, or four pieces, according to their fize, and let in with iron bars, in rows two feet afunder, and one foot distant in the rows. They were of the great white kind, with large eyes; name unknown. They were hand-hoed soon after they were up, and horse hoed a little while after. The horse-hoe was made to earth them well up, and performed it to completely, that it contributed much to the success of the crop. Nothing more was done till the end of October, when they were taken up. The produce per acre was four hundred and eighty bushels, or one hundred and fixty sacks:

all a contractions
they were fold on the spot at four shillings per
fack. Expences as follow;
Eighteen bushels planted per acre, at two shillings
Cutting ditto 0 6 0
Hand-hoeing, four shillings, horse-hoe-
ing, two shillings per acre o 61 o
Planting, per acre o 8 o
Expence of taking up, per acre 2 8 0
in gralative veges. In landar der wassers hade
oralety of error in James of the ward of the fine of the contract of the contr
N. B. The expence of carrying home
Lawrence included to be bought and the
Produce, apoint
One hundred and fixty facks, at four
fhillings per fack

Here the profit appears to be very confiderable: but it should be observed, that in this calculation, there are no allowances made for cultivating the land, with rent, tythe, and manure, &c.

There have been instances of potatoes planted fo late as June, having succeeded wonderfully well, so as to produce very good crops: but this practice I would not recommend; for, singular success in particular scasons ought not with the judicious, to establish a rule. I would therefore advise the planting them towards the middle

dle, or at latest, in the end of April; when they will run little or no risk from frosts, and have full time to come to proper size and maturity by the month of October, which is the best time for taking them up.

Mr. Baker, who has given us the reports of the experiments made by the Dublin Society, informs us, that having tried the culture of potatoes, by putting dung over them, and under them, he found those succeed best, where they lay over the dung; at the same time I must observe, that they would be better if not laid in contact with the dung, but had a thin stratum of earth between.

A noble Lord in my neighbourhood, collects the leaves from his trees, and lays them over the plants, before they are covered with the mould: this is a very fensible plan; because they not only afford additional manure, but keep the earth light upon the seed, which gives them an opportunity of spreading their fibrous and fruitful roots.

The idea, which I mentioned before, respecting the culture of the Scotch and Anjou cabbages, might, I am well convinced, be very successfully applied to that of potatoes; differing, however, somewhat in the manner of planting them. Let us therefore suppose the ground in which they are to be set, is properly prepared by plowing, as before mentioned: let then surrows be

drawn in it at four feet distance all over the field, and crossed by other surrows at an equal distance. Where these intersect each other, lay in some dung, from a wheel-barrow, extending from the point of intersection fourteen or sisteen inches each way: let a man, following, spread a little of the mould from the surrow over the dung; let a third hand lay down the seed in a quincuna form, that is, put one whole sound potatoe at the point of intersection, and one in each surrow, at a foot distance from the center, which will make sive in all: a fourth hand should now sollow with a barrow sull of leaves, and lay them over the plants, should then sprinkle some mould lightly over them, and leave them so till the plants shoot.

Thus the plants will occupy a space of two seet each way out of the sour seet between the surrows; and the remaining intervals between the plants on each side, will also be two seet; which intervals I would horse-hoe at the proper periods, first one way of the field, and then across; laying the mould upon the plants at each hoeing; so that the spaces which the plants occupied, would by these means become little square hills, filled with roots: and the intervals between, being thus hoed and cross-hoed, would have the usual good effects of pulverizing the soil, destroying the weeds, and preparizing the soil, destroying the weeds, and prepari-

ing the land in the best manner possible for a crop

Potatoes, like all other plants, are subject to distempers; that which seems to infect these is called the curled disease, or blight. It first shows itself by a defect and curling in the leaves and stalks of the plant, the cause of which is not yet perfectly understood; though I am convinced it is the same effect, proceeding from many different causes, of which I shall presently have occasion to speak.

In treating of this distemper, which is often very fatal to whole fields of potatoes, some recommend one remedy, and some another. Mr. Smith, a correspondent of the Bath Society recommends, as a preventive, planting them in the autumn rather than in spring.

He directs to plant them in rows pretry deep, and to draw the earth over them with a hoe, so as to keep them from the frost. In the spring, says he, take down the ridges raised by the hoe, and when the weeds appear, hoe the intermediate space between the rows; and when the plants appear, draw up the earth round them. They will be better if dung is put in the trenches when the potatoes are planted, for it will help to preserve the roots from the frost.

It is well known, adds he, that bulbous-rooted flowers

flowers never bloffom well, if removed in the fpring: now as potatoes are bulbous, the fame inferences may be drawn in regard to them. The best time for planting tulip-roots is, the month of November; for which reason, he thinks that time is also best for pototoes.\*

Another correspondent of the same Society is of opinion, that this distemper proceeds principally from the use of bad seed, which, in planting potatoes, is generally the rubbish of the crop; whereas intelligent farmers are very particular, nay even curious, in the choice of their seed-grain.

A third is of opinion, that this disease is caused by an insect produced by frost, or bad keeping before setting.

A fourth attributes the cause of this disease to a white grub, or insect which he found near the root, about half an inch long, with eight or ten legs, its head brown and hard; and upon examining a number of the curled roots, he found them all bitten, chiefly from the surface to the root, which of course stopped the progress of the sap, and threw the leaf into a curl. The uncurled roots were not bitten.

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Bath Soc. Tranf. Vol. II. p. 297.

<sup>+</sup> Bath Soc. Trans. Vol. II. p. 247. Coat only smeet species

Bath Soc. Trans. Vol. I. p. 240.

He tried a few experiments, as follow. First, he put soot to the insects in the rows for two days, and after that put lime to them for the same time, but they still kept lively: next, he put a little salt, which destroyed them in a few hours. From whence he infers, that if coarse salt were put into the ground, at the time it is preparing for potatoes, it would effectually cure this distemper.\*

These are but a few of the many causes assigned for the curled disease or blight in potatoes, which probably may be all true: and although many remedies have been prescribed, yet as the causes are not perfectly understood, their effects are more uncertain. Certain it is, however, that many of the preventives here mentioned, are rational and salutary; such as, good seed, whole potatoes, or large sets, good land well plowed; and if also well limed, there is great reason to believe that, with timely hoeing, particularly horse-hoeing, the crop would escape undurt by any distemper whatever.

I have here recommended whole potatoes or large fets, and have fince observed from a series of accurate experiments, made by Mr. Anderson of Edinburgh, and transmitted by him to the Society at Bath, that he is perfectly convinced of the great utility of this precaution; having always

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Bath Soc. Tranf. Vol. I. p. 241, with with

found, that there should be considerable substance in the feed, in order to have a fruitful crop.

Perhaps no manure agrees so well with potatoes, as lime; they like a sweet dry, land; and lime both sweetens and dries, at the same time that it kills vermin more than any other thing. Potatoes are much injured by wet; even too much dung hurts them in this respect, and therefore, when planted with dung, it is certainly right, to draw some earth over it, before the sets are put in the trench.

It has been observed by farmers, that if the potatoe-haulm is eaten off by cattle, the root does not grow to any size: from hence it seems certain, that this, like most other succulent plants, receives much nourishment by its leaves. When the haulm begins to decay, and becomes of a dark brown, it is no longer useful to its roots, and may then be eaten without injury.

I believe there is no culture better adapted to the reclaiming and improving of uncultivated, waste, or wood-lands, than that of the potatoe.

Ireland can furnish proofs of this, in numberless instances. Many large tracts of wood-land have been stubbed up, and brought into fine tilth by means of the potatoe-hulbandry: and much are the poor and wretched inhabitants of that country indebted to this excellent plant; by which hand alone, thousands of families are maintained for two thirds of the year.

Mr. Joseph Hazard, a correspondent of the Bath Society, and who seems to be a man of much experience in the culture of potatoes, gives the following directions concerning them.

It may be right, says he, to inform those who have only a small spot of ground, how they may obtain a plentiful crop.

First then, the earth should be dug twelve inches deep, if the foil will allow of it; a hole should be opened about fix inches deep; horsedung, or long litter, should be put into it three inches thick; the hole should not be more than twelve inches diameter: upon this dung, or litter a potatoe should be planted whole, upon which a little more dung should be shook, and then earth put over all. The whole plot of ground should be treated in the same manner, taking care that the potatoes be fixteen inches apart: and when the young shoots make their appearance, they should have fresh mould drawn over them with a hoe: and if the tender shoots are covered, it will prevent the frost from injuring them: they should again be earthed, when the shoots make a second appearance, but not so as to be covered; as in all probability the feafon will be then less severe.

A plentiful supply of mould should be given them,

them, and the person who persorms this business, should never tread on the plant or hillock round it; as the lighter the earth is, the more room the potatoes will have to expand. From a single root, thus planted, very near forty pounds of large potatoes were obtained; and, in general, over the whole plot, they produced from sisteen to twenty pounds weight from each root. Cuttings, or small sets, will not do for this purpose.

The fecond method will better fuit the indolent, or those who have not time to dig their ground:

Where weeds much abound, and have not been cleared in the winter, a trench may be opened in a straight line, the whole length of the ground, and about fix inches deep: in this trench, the potatoes should be planted about ten inches apart: fmall potatoes, or cuttings will do for this method. When they are laid in the trench, the weeds that are on the furface may be pared off on each fide, about ten inches from it, and be turned in upon the plants: another trench should then be dug, and the mould from it should be laid carefully over the weeds in the former trench. The trenches should be regularly dug, in order that the potatoes may be ten or twelve inches from each other, throughout the piece. Even this flovenly method will, in general, raife more potatoes thanthem, cancan be produced by digging the ground twice, and dibbling in the plants; and the reason is, that the weeds lighten the soil, and give the roots room to expand. They should be twice hoed and earthed up in rows. If cut potatoes are to be planted, every cutting should have two eyes: for though fewer sets will be obtained, there will be a greater certainty of a crop; as one eye of ten fails, or is destroyed by grubs in the earth.

Where a crop of potatoes fails in part, as will be the case in a dry season, they may still be made to succeed, by laying a little dung on the knots of the straw or haulm of the potatoes that do appear, and covering them with mould; each knot or joint thus managed will; if the weather prove wet afterwards, produce more potatoes than the original roots:

from the finallest potatoes planted whole, from four to fix pounds have been produced; and some of the fingle potatoes weighed near two pounds. These were dug in, as before mentioned, in trenches, where the ground was covered with weeds, and the soil was a stiff loamy clay. These small potatoes are held in great contempt for planting, by those whose prejudice will not allow of their trying experiments: but upon trial, they will be sound to answer perfectly well; though they ought by no means to be dibbled in; as the

person using the dibble treads the ground, and thereby prevents the young fibres from expanding.

A good crop may be obtained, by laying potatoes upon turf, at about twelve or fourteen inches apart, and upon beds of about fix feet wide, on each fide of which a trench fhould be opened about three feet wide; and the turf that comes from thence should be laid with the graffy side downwards upon the potatoes. A fpit of mould should next be taken from the trenches, and spread over the turf; and in like manner the whole fpot of ground to be planted should be treated. When the young floots appear, another spit of mould from the trenches should be strewed over the beds, fo as to cover the shoots: this will prevent the frost from injuring them, encourage them to expand, and totally destroy the young weeds; and when the potatoes are taken up in the autumn, a careful person may again turn the earth into the trenches, so as to make the surface level: and it is proper to observe, that a better crop of potatoes may be obtained from the same ground the year following in a small the first and the transplanter white

For field-planting, a good, if not the best method is, to dung the land, which should be previously plowed. When it is plowed a second time, a careful person should drop the potatoe plants before the plough in every third surrow, at about noting

eight or ten inches apart. Plants cut with two eyes are best for this purpose. The reason for planting them at the distance of every third surrow is, that when the shoots appear, a horse-hoe may go upon the two vacant surrows, to keep them clean; and after they are thus hoed, they should be moulded up in ridges: and if this crop be taken up about October or November, the land will be in excellent condition to receive a crop of wheat; though I should prefer taking up the potatoes sooner, in order to get my wheat sooner in the ground.

Lands that are full of twitch or couch-grass, may be made clean by this method; as horse-hoeing is as good as a summer-fallow: and if, when the potatoes are taken up, women and children were to pick out that filth, not any traces of it would remain, and by laying it in heaps and burning it, a quantity of ashes would be produced for manure.

Dibbling, planting, and hoeing, all tread the ground, and therefore should be done with care; for the mould over potatoes should be as light as possible, to allow the younger roots to shoot out and extend themselves. This it is, that makes it so eligible to lay seaves, or weeds, or long litter, over the young plants, before the earth is laid upon them.

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Vacant spaces in hedge-rows might be grubbed up, and planted with potatoes; and a good crop might be expected, as the leaves of trees, thorns, &c. are a good manure, and will surprisingly increase their growth.

Besides that the cultivating of such places is a saving of other ground, it hastens the growth of the hedges, and occupies a space which is too often filled with weeds: and this space will be well prepared for corn another year.

Gravelly, firong, chalky, or ftiff clay land, will never produce many potatoes; and the few they do produce, will be cankered, and only fit for pigs. Such foils are therefore improper \*.

The Rev. Mr. Close, of Trimley, in Suffolk, tried an experiment on the culture of potatoes, which I shall here relate.

An acre of mixed loamy land was plowed three times after a crop of cabbages, and on the 28th of April 1784, half of it was fet with the best Poland oats; occupying spaces of two feet and two inches, and leaving intervals of the same width.

On the 12th of May those intervals were split with a double-breasted plough, and planted with champion potatoes. August 24th, the oats were cut; and when threshed yielded ten coombs, or five

Bath Soc. Tranf. Vol. III. p. 292.

pliarters of extraordinary large, heavy grain. October 5th, the potatoes were plowed up, and produced thirty facks of very fine potatoes, half of which fold at fix shillings per fack, and half at feven fhillings.p od avat finish W 42

The potatoe-land was immediately fet with wheat, and promifed a fine crop.

The oat-stubble, after having several plowings, was, on the 16th of April, planted with potatoes. The produce per acre of land fo cultivated, flood thus:

Thirty facks of potatoes fold for ..... fo 15 0 The five quarters of oats for feed ..... 5. 5 than's experiments made to

Total £15 West thresh similard hoses in

Add to this, the advantage of having at least half the land in good order for a crop of wheat; which must make it appear a beneficial method of cultured boyd romo your outs withdrawy water

Mr. Close reduced the price of setting wheat with a five-pronged frame, to four shillings and ten-pence halfpenny per acre.

The potatoes on the oat stubble produced fortyfive facks, of three bullels each, from the half acre. Sir William Fordyce, in a letter to the London Society, speaks much in favour of the Surinam or chaffered potatoes, with which he fed his faddle-horses instead of oats; giving them

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after the rate of a quartern per day each, boiled, upon which quantity they supported their work well. He is of opinion, that horses thus sed, would be less subject to the grease than those sed on oats. Sir William says, the quantity of these potatoes which he raised in lazy beds on the deepest clay ground, was so great, that he dares not venture to affirm it, unless the witnesses to the sacts were present. He believes, an acre of land thus cultivated, and the produce applied to the seeding of cattle, would pay better than any crop about London.

Mr. Young is very diffuse on this subject, and gives us the result of many experiments made to ascertain the produce and profit on the culture of the clustered potatoes. These are given at great length in the London Society's Transactions,\* and the result is, that Mr. Young found them much more productive than any other kind he tried. They answered well as a fallow crop, paying all the expences of preparing the land for wheat, which, by means of this crop was brought into the finest order for that grain.

With him they succeeded in feeding of hogs, when boiled and mixed with barley-meal, and also for horses. But there is one objection to this kind of potatoes, which I imagine is the cause why

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they are not more generally cultivated; their running so into clusters prevents them from being easily washed; it is indeed almost impossible to get the mould from amongst them, and when boiled, the earth dropping to the bottom of the copper is apt to settle there and burn it.

Mr. Anderson says, that by distilling potatoes, he produced from them a very fine tasted and ardent spirit. This useful discovery farther pursued, so as to ascertain with precision the real quantity and quality of the produce, may still increase the utility, and open a new field for the culture and consumption of this excellent root.

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for the table, would be even by cardle. Yet it is

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PLINY is of opinion, that Turnips ought to be effected next to corn, or at least next to beans; for that, after them, nothing is of greater use. They grow, says he, for all animals: four-footed beasts delight in their leaves; men are as well pleased with their tender shoots in their pro-

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<sup>.</sup> Bath Soc, Trans-there between beto these

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per season, as with sprouts; and their roots are so great a relief, when there is a scarcity of corn, that they are capable of preventing a samine.

Mr. Miller is therefore justly furprifed that fo great an improvement as the fowing of turnips in the field, for feeding of cattle, should have been fo long neglected as it was in every part of Europe; fince it is very plain that this hufbandry was known to the ancients : for Columella, likewife, in treating of the different kinds of vegetables which are proper for the field, recommends particularly the cultivating of good flore of turnips; because such of them as were not wanted for the table, would be eaten by cattle. Yet it is not many years fince the raifing of this plant for cattle has been in general use: nor is the right method of cultivating turnips yet fufficiently known, or at least is not practifed, in some of the distant counties of England; for in many, the method of hoeing the plants is not understood, to that weeds and turnips are fuffered to grow together, and where the turnips come up thick in patches, they are never thinned; through which

<sup>\*</sup> The Philosophical Transactions (No. 90) relate, that in the years 1629 and 1630, when there was a dearth in England, very good white, lasting, and wholesome bread was made of boiled turnips, mixed with a small quantity of meal. They fermented well, and kneaded kindly together.

neglect they draw up to have long leaves, but never have good roots, which is the principal part of the plant, and therefore should be chiefly attended to.

It is perhaps more curious than useful to obferve, that in Columella's time, turnips were much esteemed and cultivated in Gaul for the sood of cattle, which were chiefly sed with this root in the winter time. Yet strange as it may appear, I have been informed by Mr. More, Secretary to the Society of Arts, &c. in London, that he has had applications from some of the first improvers in France for the right turnip-seed; as a species of plants not yet understood, or cultivated in that country.

The forts of turnips most profitably cultivated for the food of cattle, which is our object here, are the red or purple-topped, and the large green-topped. The roots of both of them, which are only varieties of the same fort, will grow to a large size; but those of the latter will continue longest good; for which reason this is generally and justly preferred. The red or purple topped turnip is also extremely good for some time; but its roots become stringy much sooner than those of the green-topped: for which reason it is not now so much cultivated, as it was formerly.

The green-topped turnips, which are the fofteft, and sweetest tasted, grow more above ground,

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than any other fort of this plant; and therefore are, befides being the best in other respects, the most convenient for seeding of cattle. Their long tap-root supplies them with sufficient nou-rishment. But this situation renders them very liable to be hurt by frost in severe winters, especially if they are not covered with snow; for alternate hard frosts and thaws will make them rot sooner, than those whose sless tender. Madu Hamel has had turnips of this fort upwards of nine inches diameter, and which weighed above twenty pounds; a proof that they are not totally unknown in France: and Mr. Miller has seen some boiled, of more than a foot diameter, which were as sweet and tender as the smallest roots.

Turnips thrive best in a light, sandy, loamy, and deep soil. If it be moist, they will grow the better in summer, especially in fresh land, where they are always sweeter than upon an old worn-out soil. For them to grow very large, the ground must be well prepared, and well manured some time before sowing: for dung laid on them would breed insects, which would damage the roots, and kill the plants. In Norsolk, a county samous for the culture of turnips, they dung their ground for this plant as much as they possibly can. Even Mr. Tull allows the necessity of dung in this case; because, as turnips have commonly

less time to grow than other plants, dung and tillage together will effect the necessary degree of pulverization, sooner than plowing can do alone.

The Society of Improvers in Agriculture in Scot. land observe, that though it be generally thought that the natural foil for turnips is a light fandy ground; yet there feems to be no reason to object to other foils, provided they be cultivated as they ought: for, by an experiment mentioned in the Transactions of the Royal Society, (No. 360) it has been found, that on moss or peat ground, turnips have increased by growth, fifteen thousand nine hundred and ninety times the weight of their feeds, each day they flood upon it. It is true, that fmall feeds, especially, thrive best in a fine mould; and as light foils are most easily made fine, they are thought to be the best for them. But why, add those gentlemen, may not clay be made fine enough, by the plough, harrow, and roller? The plowing for turnips, and all tap-rooted plants, should be as deep as possible; that their roots may the more easily descend. Indeed, if deep plowing is neglected, turnips may well thrive better on fandy grounds than on clay ; because the former, though unflirred, is more penetrable by their roots.

This observation of the Edinburgh Society is not only judicious, but extremely useful; because

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it shows, what I am convinced is perfectly just, that the culture of this very profitable root ought not to be confined to light grounds, but that it may also be raised to great advantage on heavy soils, when they are properly prepared for it.

M. du Hamel had surprisingly large turnips in ground loosened to the depth of three seet: but he does not advise going so deep, because that would be too expensive. It proves, however, the advantage of deep plowing.

This plant has also succeeded perfectly well, when sowed on ground made mellow by a crop of rank peas, and only harrowed in without plowing.

The common season for sowing of turnips is, from the beginning of June, to the middle of August, or even a little later; and, if possible, just before a shower of rain.

But the Edinburgh Society fay, this feed should be sown in a moderate rain, or immediately after it: if the season, however, should continue long dry, and the time of sowing be like to go over, it is advised, rather than wait too long, to steep the seed in soft water ten or twelve hours, and to dry it with powdered chalk, and sow it immediately.\*

It is not adviseable to sow this seed later than August, because if the autumn should not prove

Maxwell's Collection, p. 19.

mild, the plants will not have time to apple before winter; nor will the roots of those sown after the middle of July grow very large, unless frosts keep off long in autumn. The seed must be harrowed in as soon as sown, with a short-tined harrow, and the ground rolled with a wooden roller, to break the clods and smooth the surface: but the seed should not be buried above an inch deep; especially that of the large sort, which grows almost out of the ground. Two pounds of seed are full sufficient for an acre of land sown broad-cast; but one pound is the common allowance in that way. Three or sour ounces are the usual quantity to drill.

of ground: for if they are near hedges, walls, buildings, or trees, they will draw up, and be very long-topped; but their roots will not grow to any fize. They are fown in great quantities in the fields round London; not only for the use of the kitchen, but for feeding cattle; and more particularly cows in winter. They have become a wast improvement to barren sandy lands, especially in Norsolk, where many people have doubled, nay, even trebled, the yearly value of their lands, by the culture of this plant.

No feed is so uncertain as that of turnips; for, frequently the plants rise only in patches; in which

which case the furface of the vacant spaces must be loosened with a hand-hoe, and fresh seed must be sown, and covered over with a rakel: at other times, husbandmen have been obliged to sow the whole anew, two or three times, before it would take.

The chief expence is indeed the labour, for the feed is very cheap! but the ground should always be loosened, especially strong land, either by hocing or harrowing, before it is sowed. If all these precautions fail, as they sometimes do, or if the sly, which is a cruel enemy to this plant, has eaten off the young crop, so as to render it not worth the farmer's while to let the remainder stand; M. du Hamel advises plowing up the field and sowing it with verches for green sodder; or leaving it till autumn; then to give it a plowing, and sow it with wheat.

Mr. Lifle is of opinion that the best way to manage turnips is, first to harrow the ground sine, after it has been brought to a perfect tilth by plowing, then to roll it, so as to break the small clods, if any such remain, and let it lie thus till next rain; then, the ground being mellow, to sow the seed, and harrow it with short-tined harrows, which may not open the ground too deep, or bury the seed; then roll it again, in order to keep the moisture in the ground; this will make the seed sooner

fooner strike root, which may be in forty-eight hours: yet the surface must be so fine, and so lightly compressed, that the seed may sprout though it. He thinks the success, or miscarriage, of a crop of turnips, consists in these four things; first, in the seed's not lying too deep; secondly, in its not lying too wet; thirdly, in its not lying too dry; and sourthly, in its lying in a fine bed.

If the feed grows, the plants will appear in a few days, when the feafon is moift; but in dry weather they will be longer in coming up; and then it is that they will be in most danger of being devoured by the fly. When the plants have got four or five leaves, they should be hoed, to destroy the weeds, and to thin those which grow too close together; leaving the remaining ones fix or eight inches afunder, which will be fufficient room to give them the first time; but in the second hoeing, which should be done three weeks or a month after the first, especially if the ground be subject to weeds, the turnips, which will then be about the fize of common apples, flould be cut up; fo that the remaining plants be left fourteen or fixteen inches from each other, or even more; especially if they are deligned for feeding of cattle: for where the roots are allowed a good space to grow in, they will be proportionably large; and thus, what is lost in number, is more than repaid by by the increase of bulk. But in places where they are sown for the use of the kitchen, they need not be left at a greater distance than ten inches or a foot, because very large roots are not generally esteemed for the table.

Instead of the first hoeing, M. du Hamel recommends a slight plowing all over the field, with a chiffel-shared plough that has no fins. I approve much of this plan, as being both a cheaper and speedier way to thin the plants. After these two hoeings, the turnips will require no further care.

They will have attained their full fize in October, before the frosts come on; and should then be taken up, stripped of their leaves, which may be given to cattle, and laid upon hurdles in a dry place, with a layer of dry sand between each layer of turnips; and thus piled up, they will keep well for the food of cattle during the winter.

Some fow turnips on their hemp and flax grounds, when they pull up those plants; and the seed is pretty well covered by the stirring thus given to the earth. Others give their corn-stubble only a slight plowing, after harvest, then sow the turnips very thin, and harrow in the seed. These methods do very well when the ground is in good tilth. Others again, sow late turnips, merely for the sake of their leaves, which they use

use as green feed, when they are about a foot high; and in this case they sow the seed very thick.

An eafy way to have two growths of turnips in the same field is, to fow feed of the last gathering, and feed of the former year; for the latter is longer of rifing than the new feed; and the turnips, by rifing at different times, have a double chance of escaping the fly, or grub; which sometimes destroy them intirely: for it has been obferved, that these flies often come suddenly in great swarms, and eat up the turnips as fast as they rife; and that they fometimes disappear as fuddenly; fo that the turnips which rife a few days after in a neighbouring field, are not at all injured by them: confequently, when the turnips of the fame field rife at different times, one or other may escape the ravages of these baneful infects; for they destroy them only while in their feed leaf. The danger is over, when they have put out their rough leaves pretty strong, as they will in a few days, if rain falls when they first come up. Dry weather at that time is therefore dangerous to them.

One of the many ways recommended to guard against these infects is, to run a heavy roller over the whole field, if sown broad cast: or across the rows, if the turnips have been drilled. This rolling

they can neither get in or out; by which means they are destroyed. But this pressure of the earth will be very hurtful to the plants, if the ground has not been deeply plowed, if it be moist, or if it be stiff, and apt to bind. These inconveniencies are, indeed, partly remedied in the new culture, by hoeing the alleys as soon as the turnips have put forth their large leaves; for then they are out of danger from the infects, which the hoeing also helps to destroy. The horse-hoe is the only instrument with which this work can be well done; the earth being often so hard, that the hand-hoe would only scratch it.

The fly which preys upon turnips is not unlike the weevil in corn: it is nearly of the same shape, and has also hard wings.

Of the many boafted recipes for preferving turnips from the fly, few deserve any notice. I will therefore mention only those which seem to me best vouched. Mr. Miller recommends steeping the seeds in water mixed with so much flour of brimstone, as to make it strong of the sulphur. Another way is, steeping it in water mixed with a quantity of the juice of horse-aloes. The sowing of soot, or tobacco-dust, over the young plants, as soon as they appear above ground, has also been sound very serviceable: and this may

may be easily done along the surface of each drill, if the turnips are cultivated according to the new husbandry. Another recipe is to steep the seed in chamber-lye six hours, then drain off the liquor, and strew the seeds with as much slower of brim-stone, or sulphur vivum, as will render them dry enough to separate and sow in the usual manner.

But that which appears to me to promise most success is a remedy mentioned in the Transactions of the Bath Society, viz. that the bows of the common elder tree, fixed in a gate or hurdle, and drawn gently over young turnips when they first appear, will prove an excellent preservative from the fly; and if the leaves of the boughs be a little bruised, and sumigated with the smoke of burnt tobacco mixed with a small quantity of assactida, it will effectually destroy those insects; for nothing is more disagreeable to insects, than a mixture of tobacco and assactida sumigations. It will kill them instantly wherever applied.\*

In the fame Transactions, is subjoined the sollowing direction upon this subject. After the land has been plowed for turnips, and when the seed is harrowing in, let some large branches of common elder, with the berries on, be fixed in the harrow, so as to rub on the ground. The friction of the leaves and berries will leave so strong (and

<sup>\*</sup> Bath Soc. Tranf. Vol. I. p. 96.

to these insects, so disagreeable) a taint or odour on the soil, as will prevent their alighting on so unpleasing a spot, or make them speedily leave it, if they can be supposed to have been there, before the seed was sown. The effects of the effluvia of elder are much greater, and more lasting, with respect to those insects, than would at first be imagined, or even credited by the bulk of mankind.\*

It is by no means improbable, but that this fame application may be a very powerful preventive of the evil which I am now going to mention.

The caterpillar, another bitter enemy to this plant: which it very often attacks, even when it is grown so large as to have fix or eight leaves. The surest way of destroying these insects is to turn a sufficient number of hungry poultry into the field, early in the morning: they will soon devour the insects and clear the turnips. Those that are sown in drills, are least exposed to this evil; because the frequent stirring of the ground between the rows, keeps the plants constantly growing in great vigour, and they are therefore less injured by those insects.

The worm, to which turnips are very liable, may be guarded against, in a great measure, by liming the ground.

Bath Soc. Tranf. Vol. I. p. 96.

This will also render them much sweeter than they would otherwise be. It is to the worm lodged in the root of the turnip, that Mr. Lisle imputes the difease which is called hanbery by the Norfolk Farmers, and so named from a like diftemper in the heels of horses. It is a warty excrescence, formed probably by this insect, as galls are formed on the leaves of oaks. In fome years, it takes off whole crops, and turnips never thrive when they begin to grow in them.

The following experiment was tried with fuccess, to preserve turnips from the fly, and the better to fecure their growth. The feed was fowed in a nursery; where there was least danger of flugs or the fly, and where they might be eafily watered in case of great drought. Here they remained till they were large enough to be transplanted. de of April, though

Some weeks were thus gained to perfect a fallow, or give a thorough plowing to ground, which had borne a crop that feafon. The turnips being transplanted into the field, were regularly placed, and at proper distances, which greatly lessened the expence of hocing, the weeds being eafily destroyed as they appeared. If the season be dry, they may be carried from the nursery to the field in veffels filled with earth moistened till it becomes

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as thin as gruel, as is also done in transplanting of lucerne.

The chief use of turnips is, to feed cattle in the winter and spring, when there is a want of grass for their pasture. Cows, oxen, and hogs, are very fond of this food, which sattens them, and increases the milk of the former. This has made the demand for it by the cow-keepers round London so extremely great.

Sheep too eat it readily, and thrive upon it when they have been used to it early; but they do not relish it, when it has not been offered them before they are grown old: however, if they are kept fafting two or three days, most of them take to it, and when they have once tafted it, they become very fond of, and feed kindly upon it. In fome places they feed their lambs with turnips till the middle of April, though they then begin to run up to feed. Farmers choose rather to do this, than to let them hurt their clover, fain-foin, lucerne, &c. Some par boil them a little at first, till their cattle, and particularly their sheep, are accustomed to them; but a lamb only three weeks old will, after it has once eaten of this food, scoop out a raw turnip with great glee.

If turnips are not eaten clean, and well cleared off the ground, they may take root again, run to feed, and do great damage to the ensuing crop.

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The practice of turning a flock of sheep at random into a large field of turnips, is very bad; for they will then spoil more in a fortnight, than would keep them a whole winter. The best way therefore, of seeding them with these roots is, as Mr. Tull advises, and after him M. du Hamel; one or other of the three following methods; which are equally applicable to the drill, or to the common husbandry.

The first is, to portion out the turnip ground, by inclosing with hurdles, so much only as the sheep can clear in one day; and so to advance the folds further into the field every morning, until all be spent. But it is to be observed, that the sheep never eat them clean this way; but take only the leaves and the heart of the turnip: so that great part of them remains in the earth. It is true that these fragments, if lest there, rot, and become a manure: but when they are wanted for the food of the flock, we regret seeing so large a proportion serving only for manure.

The second method differs from the former, in pulling up the turnips, so far as they have been hurdled off, before the sheep are turned in. They then eat them cleaner up, being more easily come at; nor is this attended with near so much waste, as in the other way. The turnips which grow next the hurdles, should be thrown towards the

middle of the space hurdled off; because they will be less liable to be trampled upon and spoilt there, than nearer to the hurdles, where the sheep run about most, in search of the means of escaping into the open field.

The third way is, to pull up the turnips and carry them into some other ground, and there spread them every day on a new place, when the sheep will eat them up clean. This is done when there is land not far off, which has more need of dung than that where the turnips grew. The expence of carrying the turnips is compensated by saving the price, or at least the carriage and removal of the hurdles: only when the turnips are laid on a spot of grass in wet weather, the benefit of the dung and urine of the sheep, are, in a manner, lost.

This method is necessary, when the field upon which the turnips grew is wet; because, first, the sheep would trample upon them, and bury part of the turnips; which would be wasted. Secondly, in treading that wet land, they would poach it, and render it unsit for corn. And thirdly, a field may thus be dunged, which wants it more than where the turnips grew.

Turnips are always carried off the field when they are intended to fatten the larger forts of cattle, and it is best that they be cut into pieces for them, lest they choak themselves, of which they are most in danger from those of a middling size. They are given morning and evening to stall-sed cattle, which, in the intervals eat common sodder: but turnips increase their appetite to such a degree, that a middle sized bullock will consume near two hundred pounds weight of these roots in twenty-sour hours, besides hay; whereas, if hay only were given him, he would hardly eat half that quantity. A healthy bullock in tolerable good plight, when stalled, will be well sattened with turnips in three months.

But if falt is given them along with the turnips, it will fave at least a fortnight of that time; and I am affured, that if the turnips are thrown into an oven and baked for some time, they will fatten cattle much sooner than when raw; as is the case also with potatoes.

In Norfolk, and some other counties, great quantities of turnips are cultivated for feeding of black cattle, which turns to good account. The turnips are taken off the ground before the land is wetted by the winter's rains, and are laid up in barns; where they keep perfectly well. By feeding cattle thus, the farmer obtains a good dressing for his land.

Some intelligent farmers have cultivated turnips by fowing them in rows, with a drill plough.

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The distance between the rows has been different, some having placed them at two feet, two feet and a half, three, sour, and even five feet as under; and some have sown single, and others double rows. For my own part I would recommend single rows, at about two feet distance, and am convinced, that the produce from an acre of land sown in this manner, and properly horse-hoed, will be much greater, than from the same extent of ground sown broad-cast, and only hand-hoed.

The Lord Viscount Townshend, was at the pains of making a comparative trial of those two disferent modes of husbandry; which he did with great care, by dividing the field equally into disferent lands, which were sown alternately in drills and in broadcast. The latter were hoed by hand, and the former were horse-hoed.

When the roots were full grown, his Lordship ordered an equal quantity of land, cultivated in each way, to be measured off, the turnips to be drawn, and the produce weighed.

The refult was, that those cultivated with the horse-hoe were so much larger than the others, that the crop of one acre out, weighed the other by a ton and a half.

Mr. Tull recommends, from experience, fingle rows fix feet afunder. He also tried double rows, at the same distance. He likewise sowed them in

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fingle rows three feet afunder. These last yielded a greater crop, than a neighbouring field, which was sown and managed in the common way: but neither the single rows three feet apart, nor the double rows six feet as a from whence he concludes, that it is best to leave a space of six feet between the rows; for that, if the intervals are well plowed, these turnips will thrive wonderfully, even though no other moisture falls than the dew, which will sink in the earth, to their roots.

If these large intervals are intended to be drillfown with wheat in the autumn, I cannot see any great objection to having them so wide; for in fact, it is only having a greater portion of the sield prepared for wheat by a summer-sallow; but if the object were the turnips alone, I cannot help being of opinion, that they may be equally well cultivated with intervals of three seet as with those of six.

An ounce of feed will fow as much land when drilled, as a pound will in the common way; and if care be taken to distribute only the necessary quantity, much trouble will be faved in hosing and thinning the plants. But this is not an universal opinion, for some persons recommend sowing sour pounds per acre, by which means they make a large allowance for the depredations

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dations of the fly, and also for a sufficient quantity to come up.

It is perhaps unnecessary that I should again repeat, that all roots, whether potatoes, turnips, carrots, parsneps, parsley, &c. require a greater depth of soil than corn, and thrive best where the mould is light, fine, and well loosened. M. du Hamel trenched the whole of his kitchen-garden three feet deep; all his pot-herbs grew very fine, and his roots in particular, were of a surprizing size.

Mr. Tull, by drilling his turnip-feed alternately, at different depths in the earth, was fure to fucceed in one part or other, whether the feafon was wet or dry. If wet, the feed lightly covered fprouted first; and in dry seasons, that which lay deepest was the first to rise. By which means, and by mixing the feed, half new and half old, for the new always comes up soonest by a day, he had like four different comings up; and thus gave the turnips so many chances to escape the fly.

If we were fure of having rain immediately after the turnips are fown, it would undoubtedly be right to fow them very shallow: but if no rain happens, they are best deeper in the earth; because they there meet with moisture sufficient to make them grow.

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When the season has been so kindly, that all the seeds have grown, and the plants have not suffered by the fly, or other insects; they must be thinned early, that the ground may not be exhausted by those that are intended to remain, and what are left should be from one foot to sixteen inches assume.

When the turnips fown in drills thrive well, only each alternate alley need be hoed at one time, and the other a few days after; it being better to feed the plants gradually, by dividing the hoeings in this manner, than to give them a great deal of food at once, by hoeing all the alleys together, and leaving them afterwards, double the time without any culture whatever. Another advantage attending this method is, that the plants will be less liable to be killed by hot dry weather, and less apt to be damaged by heavy rains. Care will however be required, to extirpate the weeds as they rise.

An expert husbandman will bring the horsehoe to within two or three inches of the plants: but the remaining ground where the rows stand should be hand-hoed, and loosened, so as to give room for the fine sibres of the roots to strike out into the intervals: otherwise, if the land be strong, it will become so hard in those places which are not stirred, as to stunt the growth of the turnips. This may be done at a small expence and in very little time, as the horse-hoe has before stirred all the rest of the ground,

All plants fown in fingle rows are greatly benefited by this alternate hoeing of the alleys between them: for, as M. du Hamel observes, four of these hoeings, which cost no more than two entire ones, are almost as beneficial to the plants; for a plant which finds a great deal of nourishment on one fide, is better able to thrive, without receiving fo much on the other; and if in hoeing very near the plant some of its roots are broken, those on the other fide, not hoed, supply the wants of the plant, till the broken ones have made fresh shoots. The horse-hoe may therefore be brought very near to the turnips, without danger of hurting them : provided it does not force them out of the earth: and when a farmer has a great quantity of turnips to hoe, they are sooner assisted by this culture, than if all the alleys were to be hoed at once.

When these plants are grown large, and their roots are, consequently, pretty well extended; the hoe-plough need not come quite so near them as at first: nor is it necessary to hoe them at all, till they are about the bigness of one's singer.

One alternate hoeing, or, which is the same thing, two half-hoeings, will be sufficient when the turnips are sown late: but when they are

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fown early, and many weeds grow, one hoeing will not be enough.

By following this culture, M. du Hamel had turnips which weighed from fixteen to nineteen pounds; and we may depend on their being twelve pounds a piece averagely in a good foil; which is a vaft produce from an acre of land. Mr. Miller alleges, that one acre of turnips, thus cultivated, will afford more feed for sheep or ewes in the winter, than fifty acres of the best pasture at that season.

Another great advantage which attends the fowing of turnips in rows is, that it gives the best and fairest opportunity of promoting the alternate husbandry of which I have already said so much. For in this way, rows of wheat may be drilled or set between the turnips; or beans may be set, or winter tares may be drilled. The alleys or intervals, hoed as above directed, will be in the best order for receiving the seed; and care only will be required in pulling up the roots, so as not to injure the rising plants. This done, the spaces where the turnips grew, become the alleys between the beds of corn, or pulse; and may now, in their turn be horse-hoed or hand-hoed, whichever can be most conveniently accomplished.

The best turnip-seeds are obtained from the largest roots, which may either be transplanted

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for that purpose, or marked out in the field where they were sown. Those which are commonly fold in the shops, seldom produce the finest plants.

In Norfolk, Suffolk, and in this county, turnips fown in the common way are always twice, and often three times, hand-hoed with a nineinch hoe. This work requires confiderable dexterity, as the plants that are not to be cut up. should be left regularly at a foot distance from each other, and the hoeing must be begun before the plants are too forward. A farmer who is not used to this practice, and sees the withered plants the day after hoeing, will think his whole crop entirely destroyed; whereas, by this process, they will come to twelve, and even eighteen or twenty pounds weight, without their leaves. But, in order to have them of this weight, the land must be well manured, and agriculture must be well understood.

The usual course of crops amongst the best farmers in Norsolk, is first, turnips; second, barley; third, clover, or clover and rye-grass; sourth, wheat. This course has of late become very general, and keeps the soil clean. They manure, if possible, for turnips; and also for wheat. Every thing depends on the success of their turnips, and the success of these depends on good hoeing. They are their only fallow in the usual course; nor can they change them for a mere fallow, because the sheep kept to fold, and feed off the clover and rye-grass, would then starve. When they give four plowings for turnips, and hoe them well twice, they often prove worth five guineas an acre. The principal part of the crop is drawn, and carried into sarm-yards, for sattening beasts; the remainder is sed off with sheep and lambs, which clear the land of every part of them. The winter food of cows in sarm-yards is chiefly turnips, and straw\*.

To prepare the land for turnips, fays a Suffolk farmer, it should be summer-tilled: turn in the wheat-stubble about December to a moderate depth, and let it rest till the March sollowing: harrow it well; and then turn it in somewhat deeper, below the first plowing; the deeper the better; for turnips thrive best where there is plenty of mould. In May, repeat the harrowing, and turn it up with a fine rist-balk. After it has taken the benefit of the sun, harrow it down. Manure it with twelve loads of short dung, or eighteen of long dung per acre. At Midsummer, plow the dung in a good depth, with a narrow surrow, and sow the seed close after the plough. Sow from one pint and a half to two pints and

<sup>\*</sup> Bath Soc. Tranf. Vol. I. p. st.

a half per acre, as the feafon, or quality of the land may require. In a month, the plants will be fit to hoe. When they nearly cover the land, hoe them a fecond time, with a feven or nine-inch hoe, and leave the plants fourteen inches asunder. The price of hoeing, in Suffolk, is generally four shillings and four pence per acre, the first time; and two shillings and two pence the second time. A good crop will produce from thirty to forty cart loads per acre; which for many years past have fold at from three pounds to four pounds per acre.

Whenever I feel my subject of real importance, I give way to discussion; but when of less utility, I shall ever make brevity my particular aim. I consider the culture of turnips as a point so very essential in all good husbandry, that I hope I shall be excused for dwelling at some length upon a topic so interesting.

What follows is a communication to the Society at Bath, from a gentleman farmer near Ipswich. In November they plow in their wheat stubbles, and give the land four plowings after, at such times as suit their convenience. Previous to the last plowing, which should be in the latter end of June, they cart on twenty loads (or as much as three horses can draw), of rotten dung, or mulch, from the farm yard, turned up in April, or early

in May. Sometimes, as lime is the readiest and cheapest manure in these parts, it is used instead of dung : but the latter is thought preferable. One quart of turnip-feed is fufficient for an acre. New feed will come up three days fooner than old, What is plowed for the last earth, should be fowed the same day; else, unless rain falls, the ground will be too dry for the feed to vegetate. When the turnips are within three days of being fit for hoeing, if the weather be dry, they run a pair of light harrows over the field, in a direction contrary to that of fowing, and before they are hoed the first time. This is found to be of much service. The turnips should be hoed twice with a feveninch hoe, and fet out at a foot from plant to plant : fifteen or fixteen inches is still better. The labourers, who by use, become very expert, have three shillings and fix pence per acre for the first hoeing, and two and fix pence for the fecond with fmall beer. 14 Jys San Lies ment no.

Crops vary according to the quality of the land; from forty shillings to three pounds per acre in value, and are mostly fed off in the field.

In feeding them, it is customary first to draw off a rod in width round the field. This is done to prevent the cattle from spoiling them, by getting near the hedges for shelter in bad weather. The farmer first puts in his beasts, then his best wether sheep, and lastly his lambs, which eat up all

The method of turning in beafts before sheep intended to be fattened, is certainly not commendable. Neither will the beafts which are allowed to run about, fatten near so soon as those that are stalled.

It is only on light foils that they can, with any propriety, be fed off with stock in the field where they grow. In heavy wet lands, they are drawn and carried off in light carts, either to be eaten in some grass, or unplowed stubble field, or in the houses and yards at home.

This last method is preferred by the most judicious farmers, even where the lightness of their soils would well admit of feeding them where they grow. Their reasons are, that there is thus no waste of the turnips; that the food comes equally fresh to the beasts every day; that the protection from cold and wet weather, which the cattle enjoy in houses, or well senced and shedded yards, contributes much more than is generally imagined, to their health and sattening; and that by means of this, all their dung is collected and preserved, to be laid on such fields, and at such times as will be most beneficial to the ensuing crops. These advantages are lost by the method

<sup>\*</sup> Bath Soc. Trans. Vol. L. p. 137.

of feeding them in the field; for even the dung of the beafts is generally dropped under the hedges or trees, to which, after filling themselves, they fly for shelter and warmth.

The expence of carting away an acre of turnips depends on the goodness of the crop, and is from ten to fifteen shillings: which, although it is much more than saved in preventing the turnips from waste, yet inclines the covetous and indolent to feed them off the land; for they flatter themselves they have no waste, while they have lean sheep or bullocks which will eat up the offal which the sat ones have left; not considering how much better their second or lean stock would thrive with fresh and clean sood.

Turnips do well on every kind of soil with good and repeated plowings, and proper manure; but the best for them is a sandy loam.

They may be effectually preserved from the fly, if, as foon as the seed-leaf appears, wood ashes be thrown over them, as often as it is washed off by dews and rain.

Turnips are always employed as a fallow crop; after which barley is commonly fown, then clover, and next wheat. The fifth may be oats, the fixth clover and rye-grafs, the feventh peas, and the eighth barley.

<sup>\*</sup> Bath Soc. Trans. Vol. II. p. 95.

I have already given the opinions and practice of the skilful, respecting the best method of preventing the deproducions of the sly in turnips. I must not however omit to mention one more, communicated by a gentleman farmer at Drayton, in Norfolk, to the Bath Society\*, of which, he says, he has had three years experience, after having discovered it by accident.

A neighbouring farmer not having a sufficient quantity of manure for all his turnip land, was under the necessity of sowing four acres unmanured. The effect was, that the turnips on the part manured were mostly eaten off by the fly, while the four acres unmanured escaped without injury.

The Bath Society's correspondent determined to make some experiments from the above hint; and accordingly manured five acres well for turnips, and tilled three acres and a half in the usual way, without any manure. Those which were manured, were almost universally destroyed by the fly; insomuch that it was necessary to sow the land over again. The three acres and a half which had no manure, were intirely free from any injury. It is however proper to observe, that when these last were drawn, they were not near so large as the former.

Bath Soc. Trans. Vel. II. p. 235.

Not fatisfied with this trial, he determined to make another. He therefore manured fix acres of wheat stubble, which he intended for turnips the following season. This done, he immediately plowed it, leaving it to incorporate freely with the earth till the following summer; which had the defired effect: for the turnips which grew upon it, were as large as those upon the land which was manured at feed time. The two succeeding years, this experiment was repeated, with equal success. Hence he infers, that the sly was either ingendered in the new dung, or inticed by it. But when this manure is laid in the preceding autumn, it loses all its noxious qualities, and retains all its nutritive ones.

Another material advantage accruing from autumnal manuring turnip-ground is, that all the feeds contained in the manure, and which of course are carried on the land with it, vegetate almost immediately, are mostly killed by the severity of the winter; and what escapes the winter; perishes in the future plowings.

There is certainly a great deal of good sense in what this gentleman proposes, and ought therefore to be repeatedly tried in all soils and situations.

Our next care with respect to turnips is, to secure them from frosts; which when severe, it is impossible to do, unless by previously drawing and

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housing them. The expence and trouble of this would be very great in extensive culture, and could only pay in very hard seasons.

The best method of preserving them, that I have heard of, and which has been tried with fuccess by some of our most intelligent farmers is, to flack them up in dry ftraw; for they will not keep in fand, like potatoes, carrots, or parsneps. A load of straw is sufficient to preserve forty tons of turnips, and it may be thus performed. After drawing your turnips in February, cut off the tops and tap-roots (which may be given to sheep or hogs), and let them lie a few days in the field; as no weather will then hurt them. Then, on a layer of straw next the ground, place a layer of turnips two feet thick; and then a layer of straw; and fo alternately, till you have brought the heap to a point. Care must be taken to turn up the edges of the layers of straw, to prevent the turnips from rolling out; cover the top well with long straw, and it will serve as a thatch for the whole.

In this way, as the straw imbibes the moisture exhaled from the roots, all vegetation will be prevented; and the turnips will be nearly as good in May, as when first drawn from the field. If straw be scarce, old haulm or stubble will answer the same purpose.

But to prevent this trouble and expence, per-

haps farmers, in all counties, would find it most to their interest to adopt the method of the Norfolk farmers, which is to continue successively sowing turnips till the latter end of August; by which means their late crops remain good in the sield, till the latter end of April, and often till the middle of May. The advantage of having turnips good till the spring seed is generally ready, are so obvious and so great, that this practice is extending itself to the adjacent counties.\*

In cultivating turnips to advantage, fays another correspondent of the Bath Society, great care should be taken to procure good, bright, nimble, and well dried seed, and of the best kinds.

The Norfolk farmers generally raise the oval white, the large green-topped, and the red or purple topped kinds, which, from long experience, they have found to be most profitable.

The roots of the green-topped will grow to a large fize, and continue good much longer than the others. The red or purple topped, will also grow large, and continue good to the beginning of February; but the roots become hard and stringy fooner than the former. The green-topped, growing more above ground, is in more danger of fustaining injury from severe frosts, than the red or purple, which are more than half covered by

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Bath Soc. Trans. Vol. II. p. 193.

the foil; but it is the fostest and sweetest of any kind, when grown large. These have been brought to table a foot in diameter, and equally as good as garden turnips.

Turnips, continues he, delight in a light foil, confifting of fand and loam mixed; for when the foil is rich and heavy, although the crop may be as great in weight, they will be rank, and run to flower earlier in the fpring.

Turnip-feed, like grain, will not do well without frequent changing. The Norfolk feed is fent to most parts of the kingdom; but after a few years it degenerates; so that those who wish to have it in perfection, should procure it fresh every year from Norwich; and they will find their account in so doing; for from its known reputation, many of the London seedsmen sell, under that character, seed raised in the vicinity of the metropolis; which is much inserior in quality.

The great risk in sowing turnips is, their being eaten off by the fly, especially in a dry season. This is an evil, for which no effectual remedy has yet been discovered. The following, however, have often proved of service: a small quantity of soot sown over the land, at their first appearance. Branches of elder, with their seaves bruised, drawn over them in a gate or hurdle. Musk mixed with the seed before it is sown. And sulphur

phur burnt under it, after moistening it in water in which tobacco has been steeped. But showers on the plants, as soon as they appear above ground, are the best preservatives. They enseeble and kill the sly; and hasten the plants into the rough leaf, in which state they are out of clanger.

Some of the best Norfolk farmers fow turnips in drills, three feet afunder; and at a second hosing, leave them a foot apart in the rows. Thus, the trouble and expence of hoeing is much lessented, and the crop of equal weight as when sown in the common method. The intervals may easily be cleared of weeds by the horse-hoe.

An acre of land contains forty-three thousand five hundred and fixty square seet; suppose every foot contains a turnip of two pounds weight averagely, there will be an excellent mass of food, of thirty-nine tons per acre, worth from sour to sive guineas, and sometimes more. Extraordinary crops of barley frequently succeed turnips; especially when sed off the land. In seeding them off, the cattle should not be suffered to run over too much of the ground at a time; for, in that case, they will tread down and spoil twice as many roots as they will eat. It is best to confine them by hurdles to as much as is sufficient for them in one day. By this mode, the crop is eaten clean,

the foil is equally trodden, which, if light, is of much fervice, and is equally manured by the cattle.

A notion remains in many places, that mutton fattened by turnips is thereby rendered rank, and ill tasted; but this, says the Norfolk correspondent, is a vulgar error. The best mutton in that county, and sew counties, adds he, have better, is all sed with turnips. It is rank pastures, and marshy lands, that produce rank mutton.

The question however is, whether this letterwriter be really a good judge of well-tasted mutton. I must confess myself to be so vulgar, as to prefer that sed on downs, to what is sattened on turnips; but this by no means diminishes the utility of turnips properly used.

Mr. Winter, whom I have already quoted, fent to the London Society the following recipe, for preventing the depredations of the fly on young turnips, which feems to have been the refult of very numerous experiments made for this purpose, and ought therefore to be attended to. Steep turnip-feed twenty-four hours, or more, in a sufficient quantity of train, or linseed oil. Take a fine sieve, or linen-bag, drain the oil from the feed, which mix with a quantity of good earth.

\* Bath Soc. Trans. Vol. II. p. 372.

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finely fifted; immediately drill, or fow. When the plants begin to appear on the furface, let the ground be fowed with foot, from eight to fixteen bushels per acre\*.

Mr. Arbuthnot has given us an account of his experiments upon drilled turnips; which, like those on barley, and peas, are not very favourable. We do not however expect great profit from turnips, which are generally intended as a fallow crop. From this gentleman we however learn two things of consequence; viz. That rows two feet asunder will admit of sufficient culture, with the horse-hoe, and produce larger crops than at three feet asunder; and, that having tried various recipes to destroy the fly, none had answered, except the following.

He collects all forts of green weeds from hedges, hedge-rows, &c. mixes them with straw, and lays them in heaps on the windward side of the field: they are then set on sire, so that the wind may blow the smoke over the whole field. The weeds must not be too much withered, as it is the smothering of the slame which produces the smoak. This drives away the sly at once, and sayes the crop; he preserved ten acres by this method, on which the sly had begun: they were safe in three or four days.

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<sup>\*</sup> Lond. Soc. Tranf. Vol. V. p. 40.

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He values the feeding of sheep on this root, at

But of late, I find a new fystem respecting the destruction of turnips, adopted by Mr. Henry Vagg, of Chilcompton, who has discovered from experience, and repeated observations, that the fly is not that formidable foe to the turnip as has all along been imagined. He confesses indeed, that by that finall infect punctures are made in the leaves when young, which hurt the growth, and injure the plant; but that its great enemy is the white flug, of about one inch long, which arracks it in the night, and disappears at daylight. To prevent the mischief which may be done by this pernicious infect, Mr. Vagg recommends to roll the turnip field with a barley-roller, of eighteen or twenty inches diameter, in the night-time, as foon as the feed-leaf appears, and a fecond time in two or three nights thereafter, unless the turnips become very vigorous, and remain unhurt; in which case, the second rolling may be omitted. Mr. Vagg fays, that the number of dead flugs to be feen on the field after fuch an operation is incredible, and may, I am perfuaded, not only fave the turnips, but ferve as a fmall dreffing to the field. And we make the

Mr. Vagg fays farther, that he once faved a

erop of wheat by the same method, and recommends it strongly, not only for wheat, but also for slax, cabbages, and Dutch clover.

A practice fo fimple, and fo ftrongly recommended from experience, ought furely to be tried by every diligent husbandman.

## SECTION III

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Of Carrots, Parsneps, Parsley, and Shirrets.

the ball and a very limited by the second and the s

I CLASS these together, because their cul-

The Flemings have long known the advantage of feeding their horses and other cattle with carrots. It is not, however, many years, that that root has been cultivated for this purpose in England: nor does this useful, and profitable practice extend even now to more than a few parts of this country; though there is scarce any root yet known, which is more heartening food for most forts of animals, or which better deserves the husbandman's attention.

Mr. Miller, in speaking of this root, alleges, that one acre of carrots, well planted, will fatten a greater number of sheep, or bullocks, than three

acres

acres of turnips; and that their flesh will be firmer and better tasted. This last remark may be very just; but, I confess, I cannot readily give credit to the former; nor have I either my own, or the experience of others, to guide my opinion with accuracy.

We have feen in the preceding fection, that thirty-nine tons of turnips may be raifed upon an acre; nay, Mr. Baker, of the Dublin Society, has informed us, that he has had forty-feven tons of turnips from an acre: and to suppose that the produce of one acre of carrots is equal, in point of nourishment, to three times forty-seven tons of turnips, is surely saying a great deal too much in favour of a root, which however most undoubtedly deserves to be more generally cultivated; as we shall see presently.

Horses are extremely fond of this food, and there is not any better for hogs. These roots have also been of such service to deer, in parks, that when numbers of these creatures have perished elsewhere, through want in hard winters, when there has been an extreme scarcity of their usual food; those that have been sed with carrots have kept their slesh all the winter; and, upon the return of grass in the spring, have been sat early in the season. This is no inconsiderable advantage,

in places where the grafs is generally backward, in its growth.

But what gives this plant a very decided superiority over turnips is, that the crop is not so liable to fail, as crops of turnips have hitherto been: for as the carrots are sown in the spring, the plants generally come up well; and unless the months of June, and July prove very bad, they are in no danger; whereas turnips are first attacked by the fly, and slug, and in dry autumns are destroyed by caterpillars. Every farmer who has a stock of cattle, or sheep, should therefore always have a good store of these roots.

One pound and a half of feed, which should be fown in March, will be fufficient for an acre of land. These feeds are so very apt to cling together, that they are more difficult to fow, than almost any other: mixing them with a quantity of dry fand, or bran, and then rubbing the whole well together, is as good a way as any to separate them. For carrots, and all tap-rooted plants, the ground should be plowed as deep as the nature of the foil will permit, and brought to as fine a tilth as possible. After the seeds are sown, they must be lightly harrowed in; and when the plants come up, they should be hoed and thinned, fo as to be left ten inches, or a foot afunder. The hoeings should be repeated, so as to keep them clear

clear of weeds, and no other crop should ever be fown with them, if it be intended that they should have large roots fit for fodder, unless it be parsheps, which require the very same culture, and which may be profitably used for the same purpose.

The horse-hoeing husbandry managed as before directed for turnips, will make them grow
to a surprising fize. Mo de Chateauvieux has
given us a proof of it, in an experiment which he
made, in order to satisfy himself whether potherbs, in general, may not be cultivated in the
same manner as wheat is in the new husbandry,
without dung, and without the expensive labour,
and attendance bestowed upon them in the common way.

Of three beds, each forty feet long, and fix feet wide, he fowed two with carrots, and one with beets. The plants were thinned where they grew too thick, so as to leave a distance of seven, or eight inches between the carrots, and sourteen or fisteen inches between the carrots. Neither of these were ever watered, which is indeed rendered less necessary by the new hus, bandry, where the earth, being more thoroughly loosened, sucks in, and retains the moisture more; yet the leaves of the beets were three or four inches broader than those of the same kinds

kinds of plants in his kitchen garden, which had been well dunged; and though the rows were fix feet afunder, yet the leaves of the carrots met in many places.

The best-roots, which I have purposely mentioned in this experiment, I think are very nearly allied to the root of scarcity, of which we have of late heard such wonderful advantages. Those of which I now speak, were dug up on the 25th of October; were all nearly of the same size, that is, from five to six inches diameter towards their top, or thickest part.

ber, and measured from eighteen to twenty and twenty-five inches in length, and from two and a half to three and a half, and four inches in diameter; and weighed from twenty-five to thirty and thirty-five ounces.

To preserve the carrots for use, all the winter and spring, they should be dug up about the beginning of November, when their green leaves are decayed; and they should then be laid in dry sand, in a dry place, where the frost cannot reach them, in order to be taken from thence, as they are wanted. Some of the largest and straightest roots may be reserved for seed, if it be intended to save any; and, in this case, they should be transplanted in the spring, into a light and deep soil, 3 NOL II.

where they should be fet about a foot asunder every way. This ground must be kept very clear of weeds; and when the feed is ripe, which will be about the middle of August, it must be cut off. and carried to a dry place, where it should be exposed to the fun and his for several days, to dry ; it may then be beaten out, put into bags, and laid up in a dry place. This feed is thought to be feldom good after the first, or at most the second year: nor indeed will it grow, after it is more than two years old. New feed is therefore always preferred. to the property of the potential and the second

Mr. Billingsley, in a letter to the Secretary of the Bath Society, fays, that a field in which he raifed carrots was, a few years ago, part of the forest of Mendip. That field contains eight acres; the foil a gravelly loam, of a good depth. In the year 1776, it received an ample manuring with lime, about twenty quarters per acre, and was fown with turnips; in 1777 with barley; in 1778 it was again manured with horse dung, to the amount of fifteen cart loads per acre, and was planted with large Scotch cabbage.

The produce of this crop was very great, being more than thirty tons per acre; and the flock maintained with it, would altonish the farmer unaccustomed to the cultivation of this plant. Mr. Billingsley cannot therefore forbear recommendacad w

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ing in the wasmelt manner, the culture of this cabbage, in conjunction with turnips, to every fpirited improver, and particularly to those who keep large flocks of sheep.

. Every person in that branch of farming must have frequently experienced, during fevere frost and deep fnow, great difficulty in getting at his turnips. Now this inconvenience would be intirely obviated, by his possessing three or four acres of these cabbages. For their height and hardiness render them accessible at all times, and in the most sewere seasons. He will not however, fay that the produce will be equal in weight, to a well managed crop of turnips; but, is certain, that one hundred pounds of Scotch cabbages will go as far in keeping, or fattening horned cattle, as one hundred and fifty pounds weight of turnips. This, in effect, makes Mr. Billingsley's crop of thirty tons, equal to a crop of turnips of forty-five tons weight; which is a very uncommon produce indeed. But to return:

In the spring 1779, Mr. Billingsley began preparing for his carrot crop; the particulars of which are as follow.

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February 15th. First plowing, across it
the ridges of the cabbages, at four
fhillings per acre that but account pribated
March 1st. First harrowing, at nine
pence per acre dand and al ming of 61 o
April 15th. Second plowing, at four and out
fhillings per acre 1 12 0
Ditto 20th. Second (bufh) harrowing, equitation
at nine pence per acre ch. M
Thirty pounds of red Sandwich carrot-
feed, at one shilling per pound 1 10 0
April 24th. Sowing by hand in drills
one foot apart, and covering the feed,
at thirteen shillings per acre
June 4th. Hand-hoeing and thinning,
at twenty shillings per acre 8 0 0
October. Digging up, at thirty shil-
lings per acre
Carting home, cutting off tops, and fe-
* curing(1) 1 to 0 0
Rent of land
the the property of the Military better pro-
Produce. £48.10.0
Six hundred and forty facks, of four
bushels each, valued at three shillings
a fack
The state of the s
Nett profit of the crop £47 10 0
Or

Or nearly fix pounds per acre. Quantity of carrots per acre, eight tons.

From experiment made by Mr. Billingsley, he is perfectly perfuaded, that carrots are worth more than three shillings a fack in fattening of hogs.\*

The above account of Mr. Billingsley's is confirmed by another correspondent of the Bath Society, who has been in the practice of cultivating some acres of carrots annually, for a considerable time past. The objection which seems to strike him most, is the charge of thirteen shillings per acre for sowing and covering the seed in drills, which he alleges, he has found, from experience, not to be so eligible a mode as sowing the seed broad-cast. The drilled crops he tried were the worst he ever grew.

The feeds of carrots, fays he, though ever so well rubbed with sand or any other substance, will still adhere together to that degree, as to render the delivery of them in drills not only tedious, but uncertain; and wherever they fall in patches, the loss of ground is considerable: besides, the difference of nine pence, or at most a shilling per acre for random sowing, and thirteen shillings per acre for drilling, is an object worth attending to. Every abridgement of expence ought certainly to be studied, in all articles of which we wish to promote the growth. Per-

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Wish asourfor Bath Soc. Tranf. Vol. L. p. 218 to it was at

haps the method purfued by this correspondent of the Bath Society, where it can be adopted with convenience, will be found as profitable, and attended with less trouble than any other.

In a field containing forty acres, he first grew a crop of turnips, which were clean hoed, and left free from weeds; they were afterwards fed upon the land, which was immediately, in the beginning of March, manured with ten loads of dung, first plowed in with a common plough, and afterwards trench-plowed about fourteen or fifteen inches deep; two acres of which were harrowed very fine, and the feed sown about the middle of March, though it is presentable to sow about the end of that month, because the plants come up nearly as soon as those sown earlier, and are attended with sewer weeds.

The carrots came up regularly and well, were ready to hoe in the beginning of May, and were tolerably free from weeds; fo free indeed, that they were hoed out with large hoes, and proved an excellent crop. The other two acres, part of the four which had been in turnips, were prepared by plowing and manuring, as for the carrots, and fet with potatoes, which came up very clean, and proved an abundant crop. In the fucceeding year, he grew one acre of carrots with the former preparations, on the land where the potatoes had

grown;

grown; and one acre of potatoes, where the carrots had grown; the other two acres were in turnips.

For eight or ten years afterwards this field grew turnips, carrots, and potatoes, in the above-mentioned rotation; the carrots, and potatoes coming on the fame ground only once in three years, the turnips every other year; whereby the land is become so clear of weeds, and so rich, that the crops are better every year, and the expence of hoeing lessened by one half, at least.

Mr. Young is of opinion, that the tract of fand between Orford, Woodbridge, and Saxmundham, grows more carrots than all the rest of the kingdom put together. Perhaps the quantity raised in the neighbourhood of Chard, in Somersetshire, and brought to that market, may be nearly equal; and the roots superior in quality.

Mr. Young visited the former part of the country in the year 1779, and found that all the farmers there had some acres of their sandy farms in carrots. The straight, handsome, clean roots, sell at fix-pence per bushel for the London market, and all the rest are used upon the farm, chiefly for seeding the teams of horses, at an allowance of a bushel each horse per day. These borses are of the finest cart breed, perhaps in

and to not Bath Sec Trans Vol. L p. 235. T

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oats allowed them when at carrots.

Mr. Young's estimate of the expense of carrots runs thus, and is the result of experience.
Rent, tythe, and rates and rates are common price of 800.
Seed four pounds, at one shilling and no game.

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Mr. Young, from a fimilar calculation, makes them exceed the expence of turnips by twenty shillings at most. Now, says he, to counterbalance this extra expence; they are, first, much more unpenetrable to frost, and are in the above tract of country lest in the ground, to be taken up as wanted; secondly, they are not subject to any distempers, or accidents that approach to the evils of the hanbery, and the sty in turnips. They are also sown at a season when they cannot suffer by drought. Of late years, turnips have suffered so much by all these attacks, as to have subjected the farmers of Norsolk and Sussolk to very heavy losses. Thirdly, carrots last to a season of difficulty

culty (April) when stock, and especially sheepfarmers are so distressed, that they know not where to find a resource; a circumstance of superiority, which every practical farmer must be ready enough to admit,

But perhaps the greatest superiority which cartots have, is, that they may be cultivated to advantage even in pure and barren sands. Much
tillage, and very clean ground, is not required
for them, as for turnips, and a repetition of
summer plowings, which rather injures a sandy
soil, is altogether avoided in their culture. One
earth given with a trench-plough in March, and
frequent thorings on the surface through the
summer; seems to be the management for this
plant in such a soil; and, if the crop is left very
late in the ground, and the soil is very sandy, the
carrots may be succeeded by a crop of buckwheat, which does not require that the land be
perfectly free of the couch-grass.

Mr. Young alleges, that, with all these advantages, we would naturally expect to see carrots more universally cultivated by farmers, and that the reason why they are not, is, because their value is not yet ascertained with any degree of precision.

Many trials, however, to accomplish this bave been made; but they differ so very widely in the result, From the various accounts given by Mr. Young from the gentlemen who have made these trials, and from others, I should not hesitate to determine the average value of carrots to be about twenty-five shillings per ton; and supposing an acre well cultivated to produce ten tons of carrots, here is a crop which may be fairly valued at twelve pounds ten shillings, which is better than almost any common crop of wheat: and the ground finely prepared for a succeeding one.

Mr. Young, in his application of the crop of carrots, makes the heaped bushel of seventy pounds weight to be worth thirteen pence, and makes the amount of the ton averagely, to be one pound twelve shillings: but I choose to take it mode, rately at one pound five shillings.

Mr. Young calculates, that eleven tuns of carrots, the average produce of an agre, will feed
twenty wethers for one hundred days, in which
time they will be completely fattened: this
is allowing them at the rate of twelve pounds each
per day, which he thinks fufficient. In Norfolk,
an acre of turnips is allowed to fatten eight wethers.
So that it thus appears, that the produce of one
acre of carrots is fully equal to two of turnips.

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ficient for a horse per day, in lieu of oats, and will be found to come much cheaper.

Mr. Billingsley, above quoted, having grown another crop of carrots on five acres, found the produce to be about seven tons fifteen hundred weight, which I think rather a small crop; since the cultivators of this root about Woodbridge, and that part of the country, often raise from fifteen to twenty tons per acre.

Those carrots Mr. Billingsley values at twenty shillings per ton only; which is seven pound fifteen shillings per acre. The expense of culture he states thus:

Rent world freed book and bases and a viget ood
Three plowings and a bound about 100 100 10
Three harrowings this reside attack on beagand
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feems to sequire is, and it is not unulual as hat-
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which deducted from the value of the crop, leaves a profit of five pounds eight thillings per acre.

We have this farther information concerning the culture of carrots from Mr. Kirby, at Ipswich, in a letter to the Secretary of the Bath Society.

Bath Soc. Tranf. Vol. II. p. 1.

+ Bath Soc. Tranf. Vol. II. p. 227.

The foil proper for the cultivation of this ufeful root is, a fandy loam, of about feven or eight shillings per acre : that on which he has usually grown them is of a sharper nature, and not so valuable. He fometimes fowed them after turnips. fummer land barley, and peas fet on a rye-grass lay : the crop on the first has been very productive; next to that he would prefer the latter. In the first instance, the turnips are fed off in the beginning of February, and the land is then laid up in small balks and furrows, in which state it remains till the fecond week in March, when it is harrowed down, double furrowed to the depth of about twelve inches, and the feed fown thereon, at the rate of four pounds and a half per acre. As foon as the plants appear distinctly, they are fet put with a small hoe, at the distance of fix inches from each other; they are afterwards hoed twice more at different times, according as the crop feems to require it; and it is not unufual to harrow them between the hoeings, which does no injury to the root, and frequently faves the expence of a third hoeing; these three hoeings are performed at from fifteen to eighteen shillings of Carrots, Irony Mc Kish

When carrots are intended to be fown after peas, the stubble is plowed in as foon as harvest is over, in order that the land may purge itself of weeds:

weeds: in December it is laid up in small balks to receive the benefit of the frosts; in February it is harrowed down, and manured at the rate of fifteen loads per acre; the manure is plowed in about four inches deep, and in the middle of March the land is double furrowed, and the feed fown. By purfuing this method, the manure lies in the center of the foil, and not only affords nourishment and support to the carrot in its perpendicular progress, but renders it easy to be turned up by a fingle plowing, and greatly promotes the growth of the fucceeding crop of barley: with this crop, he usually lays down his land with rye-grass; in which state it remains for two years, before it is again plowed up, and fometimes longer, sould toodly ad their gots multion all

When the carrots are fit to take up, Mr. Kirby puts them out to his labourers, sometimes by the acre and sometimes by the load, containing forty bushels. For the former, if a good crop, he pays for taking up and topping, ten shillings and sixpence per acre; for the latter, from one shilling to one shilling and two pence per load; taking particular care of the tops, which are equally valuable with the roots, for cows, sheep, and swine. After the carrots are taken up, they are laid in an out-house, and well covered with straw, to guard them against the frost: though it is not unusual with

with fome farmers, to let them continue in the ground until they are wanted, which is less expensive; and the weather must be extremely severe, to injure the crown of the root, which is more hardy than either a turnip or a potatoe. Nor can they be much hurt by wet in that light soil in which they are generally cultivated: but if the soil is heavy, the best way is to draw and house them as above mentioned.

There can be only one objection to the practice of letting them remain undrawn, viz. that of the ground being fometimes rendered to hard by the frost, as not to admit of their being taken up; but this may be obviated by a little care, and attention, in watching the weather. At Ipswich, the medium crop may be about three hundred and fifty bushels, which are fold at sixpence per bushel, and is eight pounds fifteen shillings per acre; but this, I apprehend, might be greatly improved by proper attention, and a superior culture of this admirable root, such as I have already had occasion to mention.

Let us then suppose an acre sown in drills, and horse hoed. An acre will divide into one hundred and sour rows, at two seet apart; and at one soot afunder in the rows, will raise two hundred and eight carrots, which is per acre twenty-one

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thousand six hundred and thirty-two; and let us take them at M. de Chateauvieux's smallest weight, which was twenty-sour ounces, or one pound and a half, this will make the produce of an acre thirty-two thousand four hundred and forty-eight pounds, or nearly sourteen tons and a half; which, I imagine, in this mode of culture may be taking them at a fair average. Now if these are valued at what I somerly stated, twenty-sive shillings per ton, this will make the above produce worth eighteen pounds two shillings and sixpence; a calculation which, I think, may be deemed moderate.

Carrots, as the food of cattle, are certainly more substantial than turnips, or even cabbages; and therefore they will undoubtedly eat less of these than of either of the former: but this is a point which, though very desireable to be underfood, remains as yet unascertained.

The people of Flanders have found, by long experience, that carrots agree fingularly well with horfes, and that these creatures require much less corn, when they are sed with them, than when sed with hay. Nay, Mr. Young supposes, that with an allowance of fifty pounds per day to a horse, corn might be altogether suppressed; and he even mentions an instance of this in the carthorses about Orford, Woodbridge, and Saxmund-

Parlice

ham,

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ham, which he reckons a remarkably fine breed, and are fed on carrots alone, without any oats but observes, that they have an allowance of a bushel per day, which is seventy pounds weight; and thus, one ton will feed a horse thirty-two days, and an acre will feed him three hundred and fifty-two days, or nearly a year, at the expence of thirteen pounds fifteen shillings. This, at first fight, has the appearance of being dearer than oats, which, at the rate of a peck a day, makes a quarter in thirty-two days, instead of a ton of carrots, as above. Now I suppose the carrots at twenty-five shillings per ton, whereas the oats are only twenty shillings per quarter; but perhaps the horfes fed on carrots will eat much lefs hav. and the chaff given with their oats thay also be faved is fuld : remot of the former : but si, beye

We have to regret, however, that, in these matters, we have not hitherto any exact experiments to guide us.

Parsneps are another excellent, wholesome, and very nourishing food for cattle. As their culture is exactly the same as that of carrots, any repetition of that subject would be superstudies. They may therefore be sown in the same ground: their leaves will decay at nearly the same time; when they may be dug up, and laid by for use, as before directed:

Parinep

Parinep feed should be new: for it seldom

It has long been a custom in Britany, to fow parineps in the open field, for the food of cattle. In the transactions of an Agricultural Society, in that province, it is faid, that parfneps should be univerfally cultivated; because they afford the best of food for all kinds of cattle, during the winter, and may be used to great advantage to fatten them. Their hogs have no other food in that feafon, and their bullocks and oxen thrive well upon it. Their cows fed with parfneps give more milk than with any other winter fodder, and that milk yields better butter, than the milk of cows nourished with any other substance. Their horses also fatten with this food; though some pretend, that it renders them less mettlesome, and hurts their legs and eyes.

Cattle eat these roots, at first, sliced lengthwise; and when they begin not to relish them, they are cut in pieces, put into a large copper, pressed down there, and boiled with only as much water as fills up the vacancies between them. They then eat them very greedily, and continue to like them.\*

When it is considered that parsneps grow rather

<sup>\*</sup> Corps d'observations de la Societé d'Agriculture, de Commerce, et des Arts, étables par les Etats de Bretagne. Années 1757, et 1758, page 88.

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larger than carrots, and that they are yet more nourishing and substantial, and also that an equal quantity may be raised on an acre of land, we shall be ready to admit their great utility to the husbandman. This is confirmed by the estimation set upon a crop of parsneps in Britany, where it is reckoned equal in value to three crops of wheat; even at four quarters per acre. The strength and nourishment of their juice may be judged of, from the jelly they produce when boiled; and no root leaves the ground better prepared for any fort of spring crop.

Parsley is known to be such an excellent prefervative against the rot in sheep, if they are fed with it twice a week, for two or three hours each time, that it is much to be regretted there is a want of experiments on the culture of this ufeful plant, which would certainly succeed well if fown in drills and cultivated according to the new hufbandry. The few skilful persons who have raised it in the field for the use of sheep, have found it turn out to great account, though fown only in the common broad cast way. How much then, might we not reasonably expect, from its greater increase and more perfect quality, when more completely cultivated? To a farmer who abounds in flocks, this is an object of great magnitude; and to him I recommend this interesting experiment.

It is also highly probable, as Mr. Worlidge obferves, that besides preventing and curing the rot,
the taste of the mutton may likewise be much
improved by this pasture; for it is certain, that
the slesh of all animals acquires a peculiar slayour from their food. This is particularly remarked in venison: and it is as invariable, that
the sweetest mutton is that which has been sed
on the finest and sweetest grasses; as on the hills
of Scotland and Wales, in the Peak of Derby, the
plains of Wiltshire, and Hampshire, &c. and the
downs of Dorsetshire, Banstead, &c. Whilst, on
the contrary, the coarsest and rankest mutton
is produced from the grossest meadows and
marshes.

The rot in sheep is occasioned by their seeding on too much cold and moist meat, such as turnips, clover, and large rank grass in low lands; it is best remedied by hot, and dry food; and such parsley is, in a very high degree. For the same reason, those that seed in shady places in some grounds, where the dew lies long on a certain broad grass, necessarily incline to the rot; and this is prevented by turning them into salt marshes, and brackish ground, or giving them salt, with their dry sood; for salt is esteemed a cure for this disease.

<sup>55</sup> Worlidge in Houghton's Collections Wel. IV. No. 12-01

The best time for sowing parsley in the field is, about the middle, or latter end of February. The ground cannot be in too sine tilth. Mr. Miller mentions two bushels of seed as a proper quantity for an acre of land, sown pretty thick in drills, about a foot asunder, which will, indeed, be space enough for hand-horing; but if horse-hord, will require a distance of two, or two seet and a half. In this way, the plants will come to the greatest persection: less seed will thus be requisite, and the culture will certainly be performed smuch cheaper.

The roots of the common garden parfley will, when thus cultivated, grow to the fize of a middling parfnep. Those roots may also be boiled, and caten, as young carrots; for they are very palatable and wholesome, especially for those who are troubled with the gravel. The Dutch are very fond of them for their water-southies.

Hares, and rabbits are so fond of parsley, that they will come from a great distance to feed upon it: so that whoever chooses to have plenty of those animals in his fields, need only stock them well with this plant, and he will soon draw to him all the hares of the country: but at the same time, to those whose object is the care of their farm, and not the sports of the field, this may come to be attended with great inconvenience;

for though the parsley-ground may be secured by a sence, yet those creatures once attracted, may fall heavy upon other product of the sarm, less carefully desended. This indeed seems to me the most serious objection to the culture of this otherwise very useful plant.

The common garden shirret (Sium, or Sisarum), may likewise probably do well for cattle; for it is a very nourishing root, and has a sweet taste. Its proper culture is exactly the same as that of carrots, and parsneps, and there is no doubt of its succeeding well in the new husbandry; for M. de Chateauvieux's shirrets, cultivated with the horse-hoe, in an open field, were larger and plumper at the end of six months, than those of his kitchen-garden were at the end of nineteen; even though the former had been damaged by slugs. The latter end of March, or the beginning of April, is the best time for sowing them; and if the feeds are good, they will appear in five, or six weeks after they are sown.

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## SECTION IV.

## Of JERUSALEM ARTICHOKES.

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THESE are propagated by planting the smaller roots, or the larger ones cut into pieces, with an eye, or bud to each piece, like potatoes. They may be planted either in spring, or autumn, in rows so distant as to admit of horse-hoeing, which will greatly improve them in point of size. They will succeed in almost any soil that is but tolerably deep, and will multiply exceedingly. In the autumn following, when their stems deeay, they may be taken up for use. When set in a garden, it is best to have them in a remote corner, as they are not sightly, and their roots are apt to over-run every plant around them: nor is it easy to destroy them, after they have once taken possession of the ground.

The Jerusalem artichoke (Helianthus), is a species of the sun-flower. It is a watery root, rather agreeable to the taste, but very apt to engender wind, for which reason it is little esteemed for the food of man.

SECTIO

When

When cultivated in the field, the profit of a crop of them on a clayer loam, has been found equal to the profit of four crops of wheat, on the fame quantity of land This ought to recommend them more to the notice of the farmer, and para ticularly to fuch as occupy cold wet lands, which are improper for carrots, and will not bring an equally profitable crop of potatoes. offi beloniq

The Jerufalem artichoke is a valuable food for hogs; and those who keep large stocks of them, may increase their number by means of this winter food. gensegnen al . clas Latine dinna s.

The roots of this plant strike deep and require a trench plowing, two common plowings, and the necessary horse-hoeings. They must be well manured, and fown or fet in March, from two feet and a half, to three feet alunder. 27 at 1000 152510

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fand a day. In the seed bed, the planes like all

Their plants will firske root in twenty-from hours,

Of the Mangel Wurzel, or Root of Scarcity.

cate of themselves, and followire every kind of

HE Root of Scarcity, as I before observed, is evidently a kind of Beet, of which we have the following account, transmitted to the London. Society from Metz, by Thomas Boothby Parkyns, every

Esq. who also sent some of the seeds, which were distributed to several of the members of that Society.

This feed should be sown in a bed in the garden, or other good ground well prepared, either in rows or broad-cast, and as soon as the plants are the size of a goose-quill, they are to be transplanted into rows at eighteen inches distance, and eighteen inches apart in the rows.

Care must be taken to faw them very thin, and to cover the feed, which lies in the ground about a month, an inch only. In transplanting, the root is not to be shortened, but the leaves cut at the top; the plant is then to be fet with a dibble, so that the upper part of the root shall appear about half an inch out of the ground; this last precaution is very necessary to be attended to. These plants will strike root in twenty-four hours, and a man a little accustomed to planting, willplant with eafe, eighteen hundred, or two thoufand a day. In the feed-bed, the plants like all others, must be kept clear of weeds: when they are planted out, after once hoeing, they will take care of themselves, and suffocate every kind of weed near them.

The best time to sow the seed is from the beginning of March, to the middle of April; the cultivator is, however, advised, to continue sowing

every

every month till the beginning of July, to have a fuccession of plants.

Mr. Parkyns adds, that both leaves and roots are excellent food for man and beaft. This plant is not liable, like the turnip, to be destroyed by insects, for none touch it, nor is it affected by excessive drought, or the change of seasons.

Horned cattle, horses, pigs and poultry, are exceedingly fond of it, when cut small. The leaves may be gathered every twelve or fifteen days; they are from thirty to forty inches long, by twenty-two to twenty-five inches broad. This exfoliation affifts the increase of the root, instead of destroying it, as it does that of the beet-root, which it resembles very much, both in the seed and leaves. This plant is excellent for milch cows, when given to them in proper proportions, as it adds much to the quality, as well as quantity of their milk; but care must be taken to proportion the leaves with other green food, otherwise they would abate the milk, and fatten them too much, it is of so exceedingly sattening a quality.\*

It is almost needless to observe, that land in fine tilth, will much improve the growth of this plant, In a middling soil, they will not exceed sour or five pounds weight, and do not produce leaves above sour or five times a year: but in a good

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Lond, Soc. Tranf. Vol. V. p. 52.

foll they weigh from nine to ten pounds, and put forth fresh leaves eight or nine times.

At the end of June or beginning of July, when the outfide leaves are about one foot long, they may be gathered for the first time, by putting the thumb into the infide, and stripping them off close to their insertion into the stem. Those which bend towards the earth are what are to be gathered, but those which form the heart of the plant are to remain, avlowing ave barenting sowant

The earth round the plants should now be well ftirred, taking care to leave the crowns of the roots uncovered, for an inch and a half or two inches, as before observed, and forming round them a little hollow like a bason of nine or ten inches diameter. From this time the roots grow prodigiously, only taking care to keep them free of weeds. The leaves have been observed to grow two inches in length and one inch and a half in breadth in the space of twenty-four hours.

The roots should be taken up before they are hurt by the frost. The dryer they are when housed, the better they will keep. Like potatoes or carrots, they should be put in a dry place, in dry fand, protected from the frost; nor should they be roughly handled in carrying, for they are eafily bruifed, which makes them rot quickly.

Those roots which are intended for feed, should 100

be planted at the distance of three feet from each other and supported by stakes, for they grow five or fix feet high. The feed ripens towards the end of October, and should be gathered as soon as the white frosts appear, by cutting the stakes and hanging them up under shelter in an airy place till well dried. A root will produce ten or twelve ounces of seed.

To prevent the root from degenerating, care must be taken to change the soil every year from light to heavy, and from heavy to light land. The seed will keep three or four years unhurt.

What farther remains to be faid of this root, must be drawn from the experiments made on its culture. On this subject the information communicated by Sir Thomas Beevor to the Bath Society, is well intitled to our utmost confidence, both from the knowledge and veracity of the author.

Sir Thomas fays, that having received the feeds too late in the feafon, he nevertheless ventured to commit them to the ground on the 12th of June: and in a few days had the fatisfaction to find them rife well, and in a vigorous state. From that time to the 12th of October he gathered their leaves twice, and then found their roots of such a

<sup>\*</sup> Dr. J. Coakley Lettfom's Account of the Culture and Use of the Mangel Warzel, translated from the Abbé de Commercil.

fize as to promife a confiderable and profitable production. The measure of some of them was at that time fifteen inches round, the length of a few pulled up, about thirteen inches, and the average weight four pounds. The feeds and plants at their first growth, were not to be distinguished from beets; but in order to afcertain the difference, Sir Thomas, very judiciously, sowed fome feeds of the real beet on the fame bed of mould, and on the same day he sowed some of the mangel wurzel, and found that under the same management, the roots of this last were four times as big, and the leaves much larger than the real beet. He offered a few of the leaves to his cows, while they were at feed on very good pasture, and they readily eat them: he did the fame to his horfes, who as readily eat the broad tender part of the leaves, but rejected the thick part of the stalks. He had also the leaves of both these plants dressed and brought to his table, and was of opinion, with fome other gentlemen prefent, that there was a fensible difference in their tafte; those of the fearcity plant being so like foinage, as hardly to be diffinguished from it; while those of the beet were both harder an drier. Sir Thomas also informs us, that a week before, that is, about the 4th of October, he had feen at Lord Orford's place at Erifwell, near Barton-mills

in Suffolk, some plants that were almost twice as big as his; and he had been told, that at Mr. Dashwood's of Ely in Norfolk, there were some which measured two seet in circumserence; but these parcels were sown six weeks sooner than his were.

Sir Thomas feems to think, that this root promifes to be of the first importance in the article of food for cattle.

It is not a little fingular, that a gentleman in my neighbourhood, equally deferving of confidence, made trial of this plant, and affured me, that the ground was perfectly well prepared and trenched to a great depth, but that he found on taking up these roots, they had not penetrated to more than five or fix inches deep, though they had grown to three or four inches diameter on the surface. From this trial, he deemed them unworthy of his farther attention.

# SECTION VI.

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THIS is an ingredient fo necessary in dying and now become so considerable an article of commerce, that it claims particular attention; especially

especially as it has been found, that the madder cultivated in this country is equal to that of any other. It is likewise an object of great imports ance to the hulbandman, on account of the profitable returns it may yield him; and this without any possibility of differing with the clergy respecting the tythe, that having been lately fixed by act of parliament. sparroom in white so or solim

M. du Hamel has favoured the world with work written expressly on this subject, and he has likewife treated of it in his Elements of Agriculture; fince the publication of which, a very confe plete and fatisfactory memoir concerning it, has been given in the transactions of the Royal Society of Agriculture at Rouen, by M. Dambourney, whose judicious experiments, together with Mcdu Hamel's observations, and the directions of Mr. Arbuthnot, will enable me to lay before the public, a full and accurate account of the manner of cultivating this valuable root.

Mr. Ray mentions and describes \* four different kinds of Gallium, or Morlugo, bastard madder, natives of this country, which might afford matter of useful experiment, for persons skilled in processes of this kind.

The Hasala or Lizary of Smyrna, which is the fort used by the French dyers at Darnetal and

Aubenas,

<sup>: 101 57</sup> A Synopfis Stirpiam Britannicavam, p. 224 checially

Aubenas, to given cotton sthat fine learnation colour, for which Adrianople is famed, lik a true madder. Some species of it grow naturally under hedges and in woods : and the roots of thefe, when carefully dried, yield as fine a dycoas the Hafala of Smyrna, M. Dambourney has cultivated a species of madder, which was found growing wild on the rocks of Oifel in Normandy: and the roots of this plant have yielded him as beautiful a dye, as the Hafala of the East. I shall speak more fully of this hereafter: but cannot help observing here, that Mr. Ray describes particularly a wild madder which grows not only on St. Vincent's rock near Briftol, but also on the rocks about Biddeford in Devonshire, and in great plenty amongst the hedges, all over that county, As Mr. Ray calls this the Rubia Sylvestnis Monspe-Milana Major, and as M. du Hamel suspects M. Dambourney's Oifel madder to be that very fpecies, it is furely a matter of much importance; and well worth the attention of patriotic gentlemen, to follow M. Dambourney's example in making proper trials of them. it consuportion ni

The species most commonly cultivated is the Rubia tinstorum sativa, commonly known among us by the general name of madder. It is of this species, that the plantations of madder are made in Zealand, and in the neighbourhood of Lisle.

Madder

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Madder will live in almost any soil; but it does not yield every where equally fine productions. M. du Hamel has experienced that it is not fond of dry grounds. It likes a strong sich earth situated on a moist bottom; but it dies is slooded. He has seen it thrive well in a rich loam over a clay; and observes, that as a clay bottom prevents the roots from penetrating very deep; they glide, as it were, along that bottom, which retains the moisture, and there multiply and become very large. It is afferted that the madder, which is cultivated in the island of Tergoes, grows in a strong rich soil, somewhat impregnated with salt.

M. de Corbeilles, one of M. du Hamel's correspondents, cultivated madder with success, in a
piece of ground which is a kind of marsh. The
land is full of coarse marsh weeds; and therefore
one may reasonably suppose, from the success
which this plant has had in such a situation, that
drained marshes, and perhaps bogs, are proper for
madder. This is consirmed by the representations
that were made to the late king of France, who
in consequence thereof, exempted, for twenty
years, the cultivators of madder, in such grounds,
from one of the heaviest of taxes, (la Tuille) imposed on the husbandmen in France.

When madder is to be planted in land already in tillage, it is sufficient, in order to prepare the ground ground for the plant, to give it the same plowings as if it was intended for corn; with this general observation, that the plough cannot go too deep.

If the ground which is to be planted with madder, has not been lately broken up, it must be brought into proper tilth by the means formerly directed; and fo managed, as to be fufficiently loofened in the months of April, May, and June. When it has been brought to a fine tilth and well manured, it will be necessary to provide plants for it. It is certain that madder, as well as all other plants, can be raifed from feed; but those who live in a country where madder is cultivated. or who have a field of it, which they would facrifice in order to enlarge their plantation, may take up the plants of madder with as much care as can be, not to injure their roots, and especially not to break their slender ones, which run just below the furface of the ground; then divide thefe roots into as many portions, as there are buds or eyes upon them, and carefully replant these slips: observing, to spread out whatever runners adhere to them. About two thousand of these sets are enough to flock an acre of land. M. Dambourney practifed this method, and found it answer well a room and they read by the most of bridge

When the roots of madder are taken up for dyers, numbers of plants may be obtained from them,

them, without any diminution of the profit which they yield in other respects: for it has been experienced that the extremity of a root, provided it have but a joint and a sew fibres, will produce a plant, when it is set shallow in the earth: confequently a great number of plants may easily be procured, when a madder-ground is dug up; and these must be planted in autumn, because, in the common method, that is the season for taking up the roots of madder, in order to their being prepared for sale; but, as many of these plants generally die, it is proper to set them pretty thick, in order to their being transplanted at due distances in the spring.

When the madder-grounds are large, a great number of plants may be obtained from them, without doing any confiderable damage to the crop that is cultivated for fale.

The manner of doing it is thus. When the madder has put forth stalks eight or ten inches long, which is generally the case in the course of April, May, or June of the second year, these stalks are taken up by women, who lay hold of them near the ground, and pluck them up. Some of the stalks thus pulled come up with small sibres to them, and they readily take root again, especially if a little rain falls when they are replanted: others of them have only a little red end

bottom, and the rooting of these is less certain: fuch as are only yellow and green should be rejected, because very sew of them will take root.

Another method frequently practifed is, to lay down the stalks that they may take root, and when these layers are rooted, to divide them carefully from the mother plants, and take them up, after having first loosened the earth, the better to prevent their tender shoots from being injured thereby.

The fets, of whatfoever kind they are, must be planted as fast as they are taken up; the ground into which they are to be removed being first properly prepared.

A labourer then opens a straight channel about four inches deep, in which women or children set the plants about three inches asunder; other workmen cover the sets, by filling up the channel with mould, and then proceed to a second and a third, which forms the bed or ridge. The rows of madder are one foot asunder, and the ridge will thus be three set wide, allowing half a foot from the outside rows to the intervals of alleys, of sour seet wide, which are to be stirred by a plough, as hereafter directed. A second bed or ridge is made parallel to the first, and so on through the field.

A rainy feason is most favourable for trans-

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planting, because in it the plants more readily take root. The slips or off-sets which were laid in the autumn, and have taken root, should be transplanted in the spring, in order to give them their proper distances.

As madder may be transplanted in any season of the year, it will be right to take advantage of such cloudy weather as is the forerunner of rain, either in making a new plantation, or in replanting spots where the madder has failed: but autumn is the best time for this work; not only because the moisture of that season savours the striking of the roots; but also because the sets then taken up are better rooted than those taken up in spring.

If the foil is moist, or liable to be overflowed, the alleys should be made lower than the beds, in order to keep them dry: but in a dry soil, this precaution is not necessary.

Great care must be taken to keep the ground free from weeds; and the alleys between the beds should be frequently stirred when the weather and ground are dry. When a supply of new plants is wanted, it is in these alleys that the stem of the old ones are laid down in order to strike root and produce fresh layers. But care should be taken not to lay down too many of the stems, because the perfection of the root depends upon

the flourishing state of the foliation: one proof amongst many, of the nourishing juices which are absorbed from the atmosphere by the leaves of plants, and by them communicated to their stems and roots, through which they frequently exsude into the soil.

This is the way of cultivating madder as given us by M. du Hamel; but M. Dambourney has made fome excellent discoveries and great improvements in the manner of cultivating this plant, which I shall now give, as succincity as possible.

The foil in which he first set his plants of madder was a yellow and sandy clay, beneath which at a spade's depth was a bed of large gravel, close knit with very strong earth; but this he did not break into. In one half of this bed, which was not dunged, he set in December 1757, the plants of madder from Elbœus, which is the kind cultivated about Lisse in Flanders; in the other half he set plants of a native madder which grew upon the rocks at Oisel. In the autumn of 1758, he gathered seeds from his Oisel plants, but those of Elbœus were not then blossomed, though they had put forth stalks three seet high; and even in 1759 they produced blossoms on only a sew stalks, whilst the Oisel madder was loaded with them.

Mr. Dambourney found, notwithstanding what

has been faid to the contrary, that madder raifed from feed was nearly as forward as that raifed from flips. Both the roots of the flips and of the feeds fown, occupied the whole depth of the ground fo far as it had been loofened, and their roots had in feveral places penetrated through the hard bed of gravel underneath: but in order to pierce through it, three or four roots had twifted themselves together, and shaped themselves exactly to the form of the passage they found between the pebbles: in consequence of which, they were more or less choaked there; though they afterwards refumed their natural shape and plumpness, in a bed of fmall pure fand, which lay underneath the hard bed, and in which some of them went to the depth of four feet, the day of the

It is plain therefore that no time is lost by raising madder from the seed; and that this plant may be raised successfully in the most indifferent soils, even without the help of dung.

He took advantage of some sine weather to dry in the sun, but separately, the roots he had taken up. Every thing seemed to give the preserence to those of the Elbœus species. They were larger and redder than the others, and their powder was finer to look at: but the effect proved very different. To make a fair comparison, he dyed, with equal quantities of these sorts, two equal parcels

of cotton, prepared exactly in the fame manner: that which was dyed with the Oifel madder, took a much brighter colour, and refifted during thirty minutes a boiling, which the other could not bear during ten. He also compared its effects with that of the Lizary or Hafala of Smyrna, and the advantage, both in point of brightness and durability of colour, was also on the fide of the Oisel madder.

M. Dambourney farther observes, that the part of the roots from which the most valuable colour is obtained, is the vermicular roots, refembling in form and colour large earth-worms. Having dried them in the fun, they contracted, and their skin became wrinkled; to cure which he put them in a large fack of coarfe canvas, and shook them forcibly. The friction took off almost all the outer skin, and the remaining roots being cleaned by winnowing, are what ought to be called fine and true bunch madder, the first time there are

The colouring part, fays he, would still be finer and more valuable, if these roots were dried in the shade, under a shed open on all sides, and laid on a plaister floor, or any other substance that will abforb their moifture.

He observes also, that the easterly winds of the spring, and the heat of the summer, are both unfavourable to the fetting of the plants: he would therefore recommend autumn for that purpose. What is intended for fale, he would take up, from June to September. The impossibility of drying without fire the roots which he took up in October, put him upon trying to use them fresh, that is, in the state they were in when dug out of the ground. He then washed them well, and as this root loses seven-eighths of its weight when dried fufficiently to reduce to powder, he judged that he must proportion his quantity of fresh roots accordingly. He therefore put into a quantity of liquor, which would have required one pound of powdered madder, eight pounds of fresh roots bruised in a mortar, and with this dyed some cotton in the usual way. When the dying was finished, he found the liquor was still overcharged, though the cotton had imbibed too deep a dye: upon which he repeated the experiment with fix pounds, and afterwards with four pounds; and found that this last proportion of undried roots gave a colour equal to what is extracted from one pound of dried and powdered madder. One half the quantity of roots may therefore be faved, by dying with them when first dug; but though this is a great faving, it is not the only one. The hand with the second to side

First, There is no need to build kilns or sheds, for drying the roots in changeable weather.

Secondly,

Secondly, It exempts from the inconveniency of too hasty or too slow drying, either of which is equally hurtful to the quality of the madder.

Thirdly, The waste occasioned by the peeling, garbling, winnowing, &c. of the roots, is hereby saved: in doing of which, many if not all the small roots, that are not thicker than straws, are separated, with the resuse parts, and are generally lost.

Fourthly, The expence of grinding is faved, together with the waste and fraud which may be committed at the mill; and also the inconvenience of waiting till the mill is at liberty, which is of no small consequence, when there are not mills appropriated to the grinding of madder only.

Fifthly and lastly, The roots thus used, do not evaporate or ferment, as the powdered madder always does, if it be not speedily used.

All these advantages put together may be deemed equivalent to a saving of five eighths of the quantity. The planter who knows how to dye, may reap the benefit of them the moment his roots are large enough to be taken up: the dyers by trade will by degrees become sensible of the advantage, and share the profit with the planter, when the madder-grounds are near them: they will even find themselves under a necessity of so doing

prist.

doing whenever this method shall become general, and this will be the means of rendering it fuch; for as there is no particular time to be waited for, in order to the madder's acquiring maturity, after it has been planted eighteen months; the husbandman who carries a parcel of fresh roots to market, will be fure of selling them in that state, and the dyer may buy them daily, inproportion to the quantity he wants; or he may agree with the planter, for fuch and fuch quantities, to be delivered at fuch and fuch times. M. Dambourney also experienced, that these roots may be kept fresh during several months, by laying them in a hole three feet deep, in alternate layers of roots and of earth. This feems to me a point of real confequence in the cultivation of madder; fince it enables the planter to hold it till he finds a fuitable market, without being obliged to dispose of it to the manufacturers with precipitation, at an under value; or enter into all the detail of its kiln-drying, or other preparation.

The only remaining difficulty is, in the manner of taking up the roots of this plant, which push perpendicularly, and penetrate deep.

M. du Hamel's directions are to open the bed with a plough, without its coulter, whilst women follow and gather up the roots, If the ground is charactificace is tabing advishment link outshard,

hard, the clods are broken, in order the more easily to separate the roots from the mould.

Another way, and I think a better one, is to turn the earth of the beds over the alleys, with a pronged fork, and have women to pick up the roots, as before mentioned. This may be more tedious and more expensive, but surely the roots and small sibres will be thus more carefully collected.

If it be necessary to go pretty deep with this fort of trenching, it doubtless becomes a noble preparation for a succeeding crop of madder; turning the alleys into beds, and the beds into alleys.

M. Dambourney proceeds to fay, that, after full experience, he prefers raising madder from the feed, rather than from slips, as being by far the most expeditious way: and tells us, that his manner of doing it was thus.

Along a wall which fences off the north wind, let a trench be dug, two feet deep and five feet wide, and of any convenient length; then, towards the middle of February, let it be filled with hot dung of horses or mules, pressed down till within about three inches of the level of the ground, and then fill it quite up to the top with fine mellow mould pressed down gently, and laid smooth with a rake. This bed may be sown with

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raw activists the wife party. Accepta an or feeds

feeds five or fix times a year, and may afterwards be used for manure.

The great advantage of fuch a bed is, its gaining at least a month in the time of sowing the feed in the fpring. The feeds should be sown in drills one inch deep, and three inches apart, which facilitates the covering of the feed, and weeding of the plants. The young plants appeared in nineteen or twenty days, they were weeded and watered when necessary, and were fit to be transplanted by the 30th of April. M. Dambourney found, that steeping the feed accelerated its sprouting in the feed-bed; but this he did in a fingular way, by putting some fine mould in a box and then fprinkling some seed on the mould, then again putting a layer of mould and then sprinkling more feeds, all which he kept well watered, though exposed to the sun; and he examined the seed every day. On the eighth, the germ began to appear, and the next day it was three quarters of an inch long. He immediately laid in the channels or drills of the hot-bed, both the feeds and the mould in which they had sprouted, and, hoeing fmooth the furface of the bed, all the rows appeared distinctly two days after. The growth of these young plants was extremely rapid.

The manner of collecting the feeds ought likewife to be noticed. When ripe, all the tops were cut off with a reaping hook, and laid upon cloths in the fun. In two or three days, the stalks or leaves became so brittle and dry, that a few strokes of a switch reduced them into dust: two turns of a winnow blew away the dust, and unripe seeds; which, when dried, are lighter than the others.

After the feed has been thus feparated, it should be well dried in the sun, to prevent fermentation, or at least a mouldiness which will destroy the germ. It must afterwards be put into bags of thin cloth, and those should be hung up to the ceiling of a dry and airy place, to preserve them both from moisture and mice.

M, du Hamel thinks the month of September the most proper time for cutting madder, in order to make it into hay.

The Flemings cut theirs in August; but that is when they do not intend to fave the seed, of which indeed their madder yields but little.

Mr. Ray informs us, that the madder which grows wild in England preferves its verdure all the winter. Were this cultivated, it might become a great acquisition as a winter and spring succulent food for cattle; which would add vastly to its value, for it has been found to be an excellent fooder.

Cows fed with madder yield plenty of milk,

Sygnolog

which is a little tinged with red; and the butter of it is yellow, and well tafted.

After the madder has been cut for hay, the ground should be gently stirred, especially in the alleys; and more particularly if these are to be planted with madder the next year.

When the fame ground is to be planted anew with madder, the whole of it should be thoroughly plowed after all the roots are taken up, and the beds should now be made where the alleys were before. If the ground be sown with wheat after this second crop of madder has been taken up, the farmer may reasonably expect an abundant crop of corn: for besides that madder does not impoverish the soil, the weeding and frequent stirrings necessary for the culture of this plant, prepare it well for wheat, or any other crop.

Madder should not be too long, nor too short time in the ground; for in the former case, the roots yield less dye, than when they have only shood till of a proper fize; in the latter case, they do not yield, because they have too great a proportion of bark, which deadens the colour. The most proper thickness for those which are of a good quality is, from the size of a goose-quill, to that of the end of the little singer.

It is necessary to dry the roots of madder when they are to be carried to a distance from the place

place of their growth. For this purpose M. du Hamel has given the following directions. As the roots are taken up, they should be spread on a dry lawn: for when there is a drying funshine, and a drying wind, it will be right to take advantage of these helps, to begin to dry the roots. If the weather be lowering, or threaten rain, it is most adviseable to spread the roots on hurdles, covered with coarfe cloth, in order to their more easy conveyance under cover, in case of rain. If it be rainy, they should be spread in barn-floors, or laid under sheds. For the greater convenience of turning them, which it is necesfary to do frequently, both that they may dry equally, and to prevent their tendency to fermentation, to which they are very liable; there should be two fets of hurdles, each covered with a coarse cloth, and when the madder is to be turned, one of these hurdles, then unoccupied, being laid over the roots, and held fast to the under one, on which they were previously spread, the whole may be inverted together, in fuch manner, that the roots will remain spread, as they were before, at the fame time that they will be turned on the hurdle last applied. Another advantage attending this method is, that the hurdles themselves may be rendered quite dry, during the intervals hetween each of the turnings. Both M. du Hamel, and M. DamM. Dambourney are of opinion, that the best way of drying madder, for improving its quality, is to do it wholly in the shade by the sole action of the air upon it; which is said to be the practice at Smyrna.

If the weather is such, that it cannot alone dry the madder sufficiently to prevent its tendency to putresaction, M. du Hamel observes, that ovens may serve to complete the drying of it, where the quantity is not too great. These ovens, he says, may be heated to about forty-sive or sisty degrees of Réaumur's thermometer; that is, from one hundred and sisteen to one hundred and twenty-sive of Fahrenheit's. He likewise recommends making a place on the top of the oven to put the roots in, that they may there begin to dry.

In drying this root, great care must be taken to avoid smoaking it, that being extremely hurtful. This makes both hop and malt-kilns improper for this purpose.

M. du Hamel fays, the figns of good roots are, that they be free of spots, and have no mouldy smell. If they are black, they are to be rejected. They should be new, to yield much dye: those therefore are bad, which emit a dust when broken, or which are rotten, or worm-eaten.

Those which have a strong smell, somewhat

like liquorice, should be preferred. The madder that has been ground, should feel clammy, and adhere together in lumps when handled.

Too hasty a drying makes the bark wrinkle, and split; and as it then separates easily from the harder substance, the most useful part is lost; the bark should therefore be smooth, entire, and adherent to the woody part. This bark must not be consounded with the outer bark, which last can only lessen the brightness of the rest.

On breaking the roots, one perceives two pretty distinct substances: that which inclines to a yellow, only parts the dye; but that which is of a deep red, is the part really useful: confequently, the highest coloured roots should be preferred.

It would be a very useful discovery, could there be a method found out, of extracting the red part, without any mixture with the yellow. I am sensible, however, that this is more the business of the manufacturer, than of the farmer, and shall therefore drop this subject, in order to proceed to Mr. Arbuthnot's account of the culture of madder, as I find it inserted in Mr. Young's Eastern Tour.

In giving this account, however, I beg leave to observe, that I by no means intend to transcribe; as this would lead me far beyond the limits I Vol. II.

have allowed myfelf: for I have more than once declared, that my constant aim is to contract, not to dilate; being fenfible how formidable long books are, even where much inftruction is conveyed to the reader and spot and an land and

Mr. Arbuthnot's idea in agriculture, as we are informed by Mr. Young, was to attend to the cultivation of those plants, which, with less trouble. would bring larger profit, than what was generally the refult of the common crops of the farmer; whose frugality, and attention to the minutiæ of the bufiness, contributed much more than his skill to procure him a livelihood.

But if extreme frugality and attention to minutiæ are the principal refources of common farmers, it must be allowed that gentlemen farmers have great advantages over them in many particulars; for instance, a greater command of capital—a more liberal knowledge of the art a less hurtful economy in trifles which prevent every fort of improvement.

It is not, however, my bufiness to combat this idea: I avoid all controversy, and argumentative discussion: I shall only observe, that if such an idea was to become general, hops, madder, weld, &c. might foon be reduced to little value, when beans, wheat, and barley, would rife to a price that would again give them the pre-eminence. Pave

My own opinion is, that far the best way for both gentlemen and farmers is, to risk little on any one crop, but to diversify their culture. This is both fase and amusing, and each crop assists another. A farmer might thus, without danger, cultivate twelve or twenty acres of madder, where his soil was suitable to such a crop; but more would be going beyond the bounds of discretion, for a love of gain.

Mr. Arbuthnot was the first person in this country, I believe, who attempted the culture of madder on an extensive scale; and from his knowledge and attention to this branch, he has clearly demonstrated that it may be done to great advantage in this country, as well as abroad.

The way he began this work, in March 1765, was by digging an acre of black loam eighteen inches deep, which he planted with winter plants; that is, with parts of the runners, and crowns of the roots, on which the buds are made for that year's growth. The rows were eighteen inches afunder, and fix inches from plant to plant. As foon as the shoots were ten inches high, the plantation was hand-hoed; which operation was repeated twice more, during the summer, so as to keep the land quite free from weeds.

1766. In the fpring of this year, as foon as floots appeared, they were earthed up with hand-

a south

hoes; and when eight inches high were drawn for planting other land; after which the rows were earthed again: when the shoots were eight inches high, they were again drawn, and after another earthing the same for the third time. In autumn, the beds were earthed again, and the haulm that remained was buried by digging earth in the intervals, and spreading it on the rows.

off and earthed as last year; also hand-hoed twice. In autumn, the crop was dug up with spades, and the madder clean picked: but the crop did not produce ten pounds, from the plants being so often drawn; so that this acre might more properly be reckoned a nursery for plants, than a crop of madder.

The expence of the cultivation of this acre, was twenty-fix pounds nine shillings without manure: and I am persuaded, that it would have turned to good account, if the plants had been drawn more sparingly, in the manner before recommended by M. Dambourney. But it is remarkable, that during all the experiments made by Mr. Arbuthnot, he never seems once to have thought of cultivating this plant from the seed; a method which seems to have succeeded so well with M. Dambourney.

At Michaelmas 1765, Mr. Arbuthnot plowed

up with a firong wheel-plough, feven acres of a fandy loam, fourteen inches deep. Upon this plowing, it was manured with ten loads of forty bushels each, of yard dung, which was turned in by landing up for the winter, on to three feet ridges.

The beginning of March 1766, plowed it again; reverling the ridges thrown up the preceding autumn. The same month they were planted with winter plants, a single row on each ridge; the plants eighteen inches asunder. The method used in planting was to draw surrows with hand-hoes, and then the sets were laid in them, and covered with hoes: I cannot conceive why Mr. Arbuthnot preserved this method to dibbling in the plants, which allows of more care in setting them upright and fixing the earth round them.

Most part of the field miscarried, owing to the falling of an unusual quantity of rain, and the spring plowing being given when the land was wet. The whole was therefore plowed up, and in May was again planted with spring plants, bought

<sup>\*</sup> Winter plants, are that part of the root on which the eye are made; and which are cut in lengths of two or three inches, in the same manner as hop plants.

Mr. Arbuthnot does not approve their use, because they remain so long in the ground that they are subject to rot, especially if it be moist. This he attributes to the want of sibres, which they had on the mother plant.

at eight shillings per thousand; the rows two seet by eighteen inches, which is sisteen thousand per acre; whereas M. du Hamel makes two thousand sufficient, owing to his very wide intervals. These plants were dibbled in, and during the summer were kept clean, by three hand hoeings; and in the autumn the rows were covered with earth dug in the intervals.

1767. This year the field was hand hoed twice.
1768. And again the same this year. In autumn, it was plowed up with the great wheelplough, to the depth of eighteen inches, with
twelve horses. Men followed the plough with
pronged forks, to throw the madder out of the
furrows, and women and children followed to
pick it up. The produce was four tons four hundred
weight on the seven acres, at four pounds ten
shillings per hundred weight.

### Expences per aere.

Carry over £ 4 14 0

† I wish, for the sake of information to the cultivators of madder, that Mr. Young had told us how Mr. Arbuthnot had procured plants at eight shillings per thousand, at a time when no madder was cultivated in this country. This, I think, required explanation.

Landing

all thought over £ 4 14 0
Landing up o 7 6
1766. Spring plowing 7 6
Planting
Plowing up 7 6
Planting the fecond time 100
The plants
Three hand hocings it and an and and o
Digging in autumn
1767. Two hand hoeings
1768. Ditto
Taking up, all expences included adT. 7000
Drying, at three shillings per hundred
ig weight . mut
Three years rent, tythe, and town charges 3 6 0
and in account, the functions were dury and the
Caron to the over the plants
Produce. Twelve hundred weight of madder, at
four pounds ten shillings 54 0 0 Expences as above
has the mer enab with how him had direct to him
to wincerp ogral a diw Clear profit & 23 11006
signa carth, was forest on the land, and in the
or, per annum, £ 7.17 12
Now, eight pounds per acre were here incurred
by accident; so that with better fortune, the profit

would have been above thirty pounds an acre.

However, to take the fact as it really happened,

K 4

the

what can be gained by common husbandry. For five quarters of wheat raised every year, which by the bye is impossible, will not equal this amount. Plants were drawn from this crop, but not in abundance.

#### o o D .... Second Experiment. Lazmaly all

Nine other acres of the same soil were plowed fourteen inches deep at Michaelmas, 1765, and dunged with ten loads an acre of yard dung, covered by landing up.

1766. This spring it was planted with spring plants, dibbled in rows two feet asunder, by eighteen inches from plant to plant; and kept clean through the summer by three hand hoeings; and in autumn, the surrows were dug and the earth thrown over the plants.

hoeings.

1768. In February, a large compost, consisting of farm-yard dung and some ashes laid on the head land, and mixed with a large quantity of virgin earth, was spread on the land, and in the summer it was hand hoed twice. In autumn, it was plowed up to the depth of eighteen inches, and the crop, when dry, amounted to twelve hundred weight per acre, at sour pounds ten shillings. But three lands, of three rows each, were left for farther

farther growth of three years longer, by way of
experiment, to discover the increase of the root
in standing three years extraordinary howorst and
when the orap was repended to be all held we
1765. Plowing
Manuring of desired and involve glioco
Landing up 0 7 6
1766. Spring earth desa
Plantings doill st made ound tong maillight onto
Three hand hoeings 200 20 20 20 20 20 200
Autumnal digging
1767. Two hand hoeings hand 1 0 0
1768. Manuring 1 2000
Two hand hoeings wolf the lead to the 100 10
Digging up bada ad account don boly alono
Drying, lat three fhillings per hundred and add
to weightsoroisem in the wind and to a 6 0
Three years rent, &c
and five dearters per acre of trotters ; and the
whole covered by nevering the ridges. It was
Produce, twelve hundred weight, at four de not
pounds ten fhillings PON MAL About 5410000
Expences as above 1,1 11.1 brin bril 26012110
on two-foot landst or Tireft werthrons wereinside
obtaining flom en revosti Clear profit 27 at 9 0
ool no does at to or, per annum f gorgano
educate the special and the second states of the second
Mr. Arbuthnot remarks on this crop, that the
plants

plants were too far afunder, and the last dunging did not answer; as by earthing, it drew up shoots, that showed the appearance of great increase, when the crop was taken up; but those tops being more succulent than the other part of the root, they withered in proportion to their succulency.

The profit is very confiderable; nine pounds three shillings per acre clear, is such an advantage, as can never be expected in the common husbandry.

### o or a Third Experimental of The gar

In 1766, nine acres were fallowed, receiving in all fix earths: the first fourteen inches deep, and landed up in autumn by the last, being at the same time thrown on to sour feet ridges.

the rate of five facks per acre of wood-aftes, and five quarters per acre of trotters; and the whole covered by reverfing the ridges. It was then planted with dibbles; fix acres, with one row on a land; two acres and a half, with two rows on a land; and half an acre, with one row on two-foot lands. These variations were made by way of trial, to discover the most profitable method of planting. The sets in each one foot afunder.

This furnmer the rows were hand hoed three times;

times; and many hard clods being tumbled, by the first hoeing, into the furrows, they were crushed to pieces by a fmall spiky roller. Inlustral

The intervals were horse-hoed thrice with a fhim, which cuts the land and weeds, but does not bury them. After each thimming, followed another implement, the double mould-board plough, with moveable earth-boards, expanding at pleafure; this machine raifes the loofe earth from the furrows, which was moved by the shim, carthing up the beds. at mid , "an at own off no

These operations were the same to all, except the half acre planted on narrow lands, which could only be hand-hoed. In autumn, the furrows were again struck with the double mould-

board plough, 1768. This year the beds were hand-hoed thrice, and the furrows shimmed three times. followed each time, as before, with the double mould-board plough. On the last hand-hoeing, two acres were fown with weld, as the madder plants stood thin on these acres.

The furrows in autumn struck as before, with the double mould-board plough.

1769. This year the rows were horse-hoed twice; and the furrows plowed with the shim and double mould-board plough thrice; but none of these operations to the two acres where the weld paid of

was fown. In July the weld was pulled; and in October the madder taken up with the great plough.

No. I. On the half-acre, fingle rows on two-feet land, fix hundred weight.

No. II. On the fix acres, fingle rows, on four-

No. III. On the two and a half acres, double rows on four feet lands, ten hundred weight per acre, and feventy-two pounds worth of weld on the two acres\*; but the half-acre, where no weld grew, was the best part.

## could only be II. of No III be wind could consult with the double mould-

Proportions per acre.
1766. Five plowings, at feven shill be to be
lings and fixpence
One deep ditto
1767. Five quarters of trotters 3 0 0
Five facks of wood-affies
Plowing the with weld as the Plowing
Planting sares abels no min boningsio
Three hand-hoeings 1 10 0
Striking furrows agood bised bluom do 1 1d2
1768. Three hand-hoeings 1 10 0
8 000 1 to Brand Catry over & de la conce of
blom on weld was that year twelve pounds a load, o clouds

Striking

Brought over Case o 8
Striking furrows
1769. Two hand-hoeings 1000 0
Taking up the madder
Drying, at three shillings
Rent, tythe, and town-charges, four
years
O 75000 TO THE TANK THE TO
nuel d'agret breed-bluen sideret 23 15 10
o b Produced band owly .gors
Twelve hundred weight, at four pounds
ten shillings
Expences
Clear profit £ 30 4 2
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A CONTRACTOR OF THE PROPERTY O
Account of No. II.
Account of No. II.
and the second s
Expences.  1766. Five earths at feven shillings
Expences.  1766. Five earths at feven shillings
Expences.  1766. Five earths at feven shillings
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Expences.  1766. Five earths at feven shillings  and fix-pence
Expences.  1766. Five earths at feven shillings and fix-pence
Expences.  1766. Five earths at feven shillings and fix-pence
Expences,  1766. Five earths at feven shillings  and fix-pence

8 o 1 Maro figue Brought over £ 9 5 9
Horfe-hoeing with fhim thrice, at eight
o pence
Ditto double mould-board plough, four
c times, at one shilling and two-pence o 4 8
1768. Three hand-hoeings 1 10 0
Shimming thrice
Double mould-board plough, four
times 0 4 8
1769. Two hand-hoeings 1 0 0
Shimming thrice was a state of the or selection of select
Double mould-board plough 8
Taking up 5 10 0
Drying, at three shillings 1 4 0
Four years rent, &c 4 8 0
and the state of the state of
Produce
Eight hundred weight, at four pounds
ten shillings
0 71 2 Expences 23 17 2
Clear profit £ 12 2 10
Clear profit & 12 2 10
Account of No. III.
1766. Plowing as before 12 14 6
1767. Trotters and ashes 3 12 6
Carry over £ 6 7. 0
TIO WINE

Brought over £16. 7 o
Plowing with warm orlabes od 7 . 6
Planting of Large Same and Political Parties of
Hand and horse-hoeing, as in No. II. 17 4
1768. Ditto
Weld feed and fowing the sand lines of 0 1 6
1769. Pulling the weld, &c 1 10 0
Taking up the madder
Drying, at three shillings
Four years rent, &c
respondence to the second of 24 is o
Produce.
Ten hundred weight of madder, at
four pounds ten shillings £ 45 0 0
Weldows nonmonusin . hot of 360 of o
agelect one idea at planting in the furrous inflead
o . 40 cm. with intention of forming the ridge
Expences 24 13, 0
Clear profit £ 56 7 0
the center of the old ridges, and the planes grow a

I have felected some of the most interesting examples from Mr. Arbuthnot's practice. To go through the whole would be too tedious, without giving important information. I shall therefore briefly state some farther observations, which arise from his experience, and the state of the state of

He made trial of an old lay, but lost his crop entirely

entirely by means of the fod or wyer worm, although he had the precaution to lime his land with feventy-four bushels per acre : but I suspect this was neither quantity sufficient, nor was the quality good, that is, the lime was not hot from the kiln; otherwife it would have deftroyed the worms.

o As madder requires a very deep foil, and a species of dunging and culture peculiar to itself. it is obvious, that the ground once prepared for this plant should be continued for the same purpofe; which may eafily be done, by changing alternately the beds and alleys.

Mr. Arbuthnot observed from an experiment made on a plant in his garden, that by earthing up the rows, the stalk was converted into the richest part of the root: this uncommon circumstance fuggested the idea of planting in the furrows instead of the ridges, with intention of forming the ridge into a rich compost, and turning it gradually to the rows, until the furrows came to be fituated in the center of the old ridges, and the plants growing on the newly made ones: in a word, to plant and cultivate madder, in the fame manner that celery is planted and cultivated. The idea is new, and feems to promife fuccess; I do not, however, know that it is yet fanctioned by experience.

It should here be observed, that Mr. Arbuthnot si the made trial of an old lat, but loft his crop is clearly of opinion, that no crop requires cleaner ground, from the great difficulty of extracting root weeds from among the fibres of the plants, which would confequently get intire possession of the ground in the course of three years. He constantly found the roots of madder to bear exact proportion to the luxuriance of the branches and

The average profit per acre, on all the crops then taken up, amounted to above feven pounds feven shillings, which is a vast deal in the culture of a new plant, that experience would certainly bring to a higher degree of perfection; for Mr. Arbuthnot's crops then on the ground promifed more than any of his preceeding ones.

If Mr. Arbuthnot had been acquainted with M. Dambourney's ingenious method of railing plants by means of feed-beds, I am perfuaded he would have adopted it with fuccess. It is fingular enough, that Mr. Young has never hinted at Mr. Arbuthnot's method of drying his roots, nor to what market he carried them; which are both points of great confequence to the grower.

C'MUT in com, and there gram though Quite different differencers, are often conformal. of because they are very often fould in the fame Vol. II. ESSAY

is clearly of equation, that no crop refleires circular ground, from the great difficulty of extraction confined which would confessiontly get into you'd coffessiontly get into you'd coffessiontly get into you'd coffession the get into you'd coffession of

## the ground in the course of three cars. He con-

proportion to the luxuriance of the branches and

Of the Enemies to Gorn, and the Means of prethen taken up, amitignity of level feven pounds teten millings, which is a vail deal in the culture

Du Hamel, in his Elements of Agricul ture, has treated this interesting subject much more fully and more accurately than any of our English authors: I shall therefore chiefly have recourse to him for information on this head.

## lar enough, that Mr. Young has never hinted at

to what market be comied them; which are both

would have adopted for with function it is fingu-

D'Of the Difeafes of Plants org to altioq

S MUT in corn, and burnt grain, though quite different distempers, are often confounded, because they are very often found in the same field, and prevail most in the same years: they both attack

attack the same forts of grain, and the mealy substance is converted by both into a powder, more or less black and offensive to the smell. They have, however, their distinguishing marks, and mult be treated of separately:

The fmut entirely destroys the germ and substance of the grain. Not only the ear, but the whole plant is affected by it: and generally the whole of the ears from the same root.

So early as March or April, upon opening the hood which covers the ear, not then above the fixth part of an inch in length and almost close to the roots, this embryo has been found black and diseased: but perhaps all are not attacked so early.

When the distempered ear comes out, it looks lank and meagre, and the immediate coverings of the grains are so thin, that the black powder is seen through them; it has a feetid smell, has no consistency, and occupies the place of the grain. As this powder is easily blown off by wind, or washed away by rain; the husbandman in housing these plants, houses only the skeletons of the ears. Any remainder of this powder is easily taken off by sifting. It has not been found contagious like that of burnt-grain.

My very worthy and intelligent friend, Mr. Small, informed me, that an acquaintance of his,

remarkable for his attention to every circumstance relating to agriculture; in order to afcertain this fact from experiment, prepared a piece of well cultivated land, in which he fowed fome wheatfeed, from a fmutty crop, and which was threshed and dreffed in common with the reft. He also picked some smutty ears, which he broke, and mixed the dust with the sound grain. He sowed both parcels in equi-diffant rows, and had both properly hoed. They produced a plentiful crop of fine grain; and Mr. Small does not recollect that there was one fmutty ear among the whole. From hence he concludes, that fmut is not contagious, and probably no infect, but proceeds from want of good culture, or fome other cause, yet un-When the differenced bar comes charavolib

The upper part of the flalk of a finutry plant, is not commonly quite straight, for about half an inch below the ear. If the stalk be cut afunder in that part, it will be found almost intirely filled with pith, and only a very small opening can be petceived, instead of the large pipe in healthy stems. M. Tillet concludes from bence, that the circulation of the juices is obstructed in the stem of smutry plants. It is singular enough, that there is no instance, to my knowledge, of smutry rye.

Some naturalists have ascribed this distemper to insects: among those is Dr. George Fordyce, whose

whose authority carries great weight: but M. du Hamel says, that having himself been of this opinion for some time, all his endeavours to establish it by facts proved inessectual.

The Reverend Dr. Hales thought the smut might proceed from the seed being bruised by the flail, and therefore took seeds of different sizes and bruised them with a hammer. They grew well, and produced no smutty plants.

The conjectures about the causes of this distemper have been so numerous, that it would be tedious to repeat them. The most sensible and approved modes of preventing it, are infinitely more useful.

M. Aimen has observed, and I believe with great justice, that weak plants are most subject to this distemper. He is therefore of opinion, that the best means of prevention are, to choose the finest and ripest corn for seed; that it should be threshed as soon as possible, and that it should be limed immediately after; as well, says he, to keep it from growing mouldy, as to destroy the mould already formed, if any such there be; adding, that every method he has tried to make corn so prepared, grow mouldy, has been inestectual and that he has never known it produce simutty ears.

He also recommends good tillage, as a fure me-L 3 thod thod of giving strength and vigour: and if horsehoed and managed according to the new mode of culture, it is highly probable it never would be fmutty. He observes, that most of the lyes in use do good, because lime is a principal ingredient in them all, and is the most effectual of any. M. de Lignerolle says, that the surest means of avoiding fmut, and what he has practifed annually, and with great fuccess, on upwards of three hundred acres of land, is to change the feed every year, to be careful that the feed corn be thoroughly ripe and well dried, and that it be not fmutty, nor have any fmutty powder sticking to it. He then washes it with a lye made with hot lime: but of these I have given various recipes in the article of preparing the feed.

Mr. Tull, too, recommends brining and changing the feed, as general remedies for fmut; but above all, he affures us, that the drill husbandry is the most effectual cure of any.

I have already observed, that M. du Hamel distinguishes burnt-grain from the smutty, and makes it infinitely more dangerous, from its being a contagious distemper, which he alleges smut is not, and of which I have just given a very strong proof.

#### Of Burnt-Ears.

The following are the characters of this distemper, which the Romans called ustilago and the French name charbon.

First, The plants which produce burnt-ears are strong and vigorous.

Secondly, The ears attacked, are not readily distinguishable from the sound; but after blof-soming, they become of a deep blueish green, and then turn whitish, and are thus easily distinguished. This distemper is thought to be occasioned by an intense heat of the sun, or by a sog, which has preceded that intense heat.

Thirdly, All the ears proceeding from the fame feed, are usually attacked with this distemper: yet found ears have been found in the same plant with the infected. Some infected ears have been found with found grains, nay even grains have been seen half sound and half infected.

M. du Hamel, in his Elements of Agriculture,\* gives a very particular description of all the signs by which burnt-grain may be known, and to him I must beg leave to refer, in order to avoid prolixity on this subject.

The cause of this distemper has hitherto been as little known as that of smut; though there have

\* Tom. I. p. 314.

anal.

been full as many conjectures about it. But the best way of preventing it is, by those methods I have pointed out in the article above mentioned, where I recommend well washing, skimming and brining, &c.

### Of the Spur, and is bee good

The diffemper called the fpur, and which the French name ergot, frequently attacks rye, and fometimes wheat. The grains which have the fpur, are thicker and longer than the found ones, and generally project beyond their hufks, appearing fometimes straight and fometimes more or less Their outfides are brown or black: crooked. their furface is rough, and it is not unufual to perceive cavities there, which feem to have been made by infects. There are yet other fymptoms, for a description of which I shall refer to the work above quoted,\* where the curious may also find many fingular circumflances about it, and particularly its fatal effects upon those poor people, who have eaten bread made of rye-flour infected with this distemper.

#### Of the Mildew.

The mildew attacks the blades and the stems of corn, which it covers with a powder of the colour

of ruft, when at the height of their vegetation, This distemper is commonly imputed to dry, gloomy, and hazy weather fucceeded by a hot fun, which will rust the corn in a few days. It is sometimes very fatal, for the finest wheat is suddenly reduced to nothing, when completely attacked by it. If it attacks the plants while they are young, and before their stems begin to rife, the mischief is sometimes not very great, provided there comes on a feafon favourable to their farther growth. In this case, they are only weakened, as if they had been fed or mowed. They shoot out anew, and produce ears: though their straw is shorter, and the ears fmaller, than they would otherwise have been. But if both blades and stalks are mildewed at the fame time, the farther growth of the plant is stopped, and the grain gets scarcely any more nourishment; so that the crop is exceedingly diminished.

M. Tillet imputes it to a sharpness in the air, in dry cloudy weather, which breaks the vessels interwoven with the substance of the blades and stem, and makes them discharge a thick oily juice, which, drying by degrees, is turned into that rusty powder.

The air in England is feldom fo dry, as to exhale all the moifture of the glutinous exfudations, and thereby convert them into the rufty powder above

above described. The extravasation of the sap feems to account for this distemper of plants, in a much more rational manner than the thick clammy dews, which some of our authors speak of, as falling in close weather, stopping the perspiration of vegetables, and hindering their juices from ascending to nourish the flowers, &c.

Mr. Miller\* takes the true cause of the mildew's appearing most upon plants which are exposed to the east, to proceed from a dry temperature in the air, when the wind blows from that point; in which case it stops the pores of plants, and prevents their perspiration, whereby their juices are concreted upon the furface of their leaves; and that concretion being of a fweetish nature, infects are thereby attracted. Those infects finding proper nutriment here, deposite their, eggs, and multiply fo fast as to cover the whole furface of the plants, and, by corroding their veffels, prevent the motion of the fap. He thinks it very probable, that the excrements of these animals may enter the veffels of plants, and by mixing with their juices, may spread the infection all over them; for it is observable that, whenever a tree has been greatly infected with this mildew, it feldom recovers in two or three years, and many times is never intirely clear from it after. But he

Gardener's Dict. Article, Mildew, Conner Bone

by no means allows these insects to be the first cause of this distemper, as some have imagined.\* It is observable, that mildews and blights frequently attack only one fort of corn, or fruit, and leave the other species unhurt.

There have never been any effectual remedies discovered for this distemper. I find one mentioned in the fourth volume of the Bath Society's Transactions, page 282; which is, to allow the corn to fland about three weeks or more after the usual time of cutting. For it is imagined, that this infection is owing to fmall infects falling on the stalks in foggy or misty weather, which cause the stalk to swell, and the knots of it to close: by which means the fun which should go to nourish the grain is prevented; and by letting it ftand uncut, the fun and air destroy these insects : the knots re-open, and the fap rifing as before, feeds the grain; which by letting it stand a proper time, will recover and become much fuller and nearly as good in quality as if no ruft had taken place. The most thanks

There is a simple cure recommended by Worlidge,† who supposes the distemper to proceed from the thickening of the dew; which is, to have, it shaken off from the tops of the corn, before the

<sup>1.</sup> Ibidem. Art. Blight.

<sup>+ †</sup> Sylema Agricultura, G. X. S. L.

men go at a proper distance in the surrows, holding a cord stretched between them, and so carried as to brush the tops of the plants. But Mr. Worlidge very sensibly adds, that the best prefervative is, keeping the ground free of weeds and stirring the earth frequently between the plants. He surther observes, that the sowing of wheat carly, is doubtless one of the best remedies against mildews; for the corn will be well filled in the ear, before those dews fall, and the increase will consequently be greater.

For curiofity's fake, wheat was fown in all the months of the year: that fown in July produced fuch an increase, as is almost incredible. In France, they generally sow before Michaelmas. Bearded wheat is not so much subject to mildews as the other, its awns keeping the dew from the car.

### man had dee on Of Blighty. In bong at which

Mr. Miller's definition of blights, taken from the observations of the reverend and learned Dr. Hales, seems to be very much the same with the definition of mildews which I have given above; though, from what Mr. Worlidge says of these last, they apparently proceed from a very different cause. Ignorant as we all are, of the secret sources fources of these evils. I will not pretend to decide between these men of much experience. on hoor

of the different kinds of blights, as they are diwided by M. du Hamel. They are di-

## llaw may suored of Empty Ears, along, Agueds

Empty cars is, when the ears instead of being full of plump grains thoughout their whole length, are destinate of any at their ends, and contain only a few small grains, in which there is scarce any flour, and which pass through the sieve with the dust and seeds of weeds.

This accident must be owing to several causes.

Heavy and cold rains when the corn is in bloom, may hinder the grains from being impregnated. Some have afcribed this evil to lightning. Others have alleged that the ears when young are hurt by frost; and if, says M. du Hamel, the vegetation of a plant is damaged or interrupted by any cause, the grains in the point of the ear, which are formed last, must suffer most. The best cultivated corn is therefore least liable to this accident.

### Of Parched and Sprevelled Corn. Potestni

Parched and shrivelled corn is, when its grains, instead of being plump, smooth, and full of flour,

are wrinkled in their skins. These yield indeed good flour; but the quantity is small in proportion to the bran, which is full as great as that of the best wheat. However, if this distemper does not prevail to a very great degree, these grains, though parched or shrivelled, sprout very well and are good for seed.

This defect is certainly owing to some accident which hinders the free ascent of the nutritive juices into the grain, when it is almost formed. The grain thus hurried on to maturity before its mealy part is perfected, must infallibly be parched and shrivelled. Several circumstances may produce this hurtful effect.

If the corn is beaten down and laid, while the grains are in a milky state, the broken or bent stalk ceases to convey the necessary nourishment to the ear, and the grains ripen suddenly without being filled: sometimes there is no flour in them; and in either of these cases they are parched. Late corn, and that which has had too much moisture, are the most liable to this accident.

Mr. Tull fays, that in cold countries, there are infects which by pricking the stems of the wheat, intercept the course of the sap, and occasion this distemper.

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#### Of Glazed Corn.

Amongst the distempers which affect wheat, this defect, of no great consequence in itself, diminishes a little the quality of the grain that has it, and consequently lowers its price, especially in plentiful years, when buyers are apt to be nice.

Men skilled in wheat require that it be heavy, of a smooth surface, and of a bright colour. If it be of a dead white, they judge that it has been washed, and have therefore some reason to reject it: and if it be of a deep yellow and inclining to be transparent, they call it glazed wheat, and are not ready to purchase it. This desect happens to corn that has been ripened by great heats, which have come on just before the ear was quite formed.

This glazed corn fprouts very well, yields plenty of good flour, and makes good wholesome bread. Mr. Lisle observes, that the preference to fine yellow coloured wheat in the market is not at all an ideal one, but proceeds from the uniformity between the colour of corn and its weight; for the best coloured is always heaviest, being the best filled and plumpest grain.

as if two or three grains were joinest together at their bottom. When these grains have attained

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#### Abortive, or Rickety Corn.

Mr. Tillet mentions abortive or rickety corn as a very fatal distemper. It shows itself long before the ripening of the corn, and even when the plants are not above a foot high. The marks which characterise it are, a deformity of the stem, of the blades, of the ear, and even of the grain.

Abortive plants do not grow to tait as found ones of the same age. Their stem is crooked, full of knots, and in short rickety. Their blades are commonly of a blueish green, and curled various ways: their ears retain but sittle of the natural shape; they are meagre, dry, withered, and present but very imperfect beginnings, either of the coverings, or of the grain.

All these symptoms do not unite in the same plant, unless the distemper be at the worst. Frequently, the stems are pretty straight, the blades not much curled, and the chests tolerably well formed; but instead of inclosing a small white downy embryo at their summit, they cover only a green grain, terminated in a point, and shaped almost like a pea beginning to form in its pod.

These abortive grains have often two or three very distinct points, which make them look as if two or three grains were joined together at their bottom. When these grains have attained

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their maturity, or rather when they are grown dry, they turn black, and look fo like the feeds of cockle, that many farmers who are unacquainted with this difference, confound the abortive grains with the feeds of that plant.

Mr. Tillet gives a very distinct account of the various symptoms of this distemper, which he sufpects to be occasioned by insects; and says, he has perceived on the distempered stalks, where he found insects, small drops of a clear liquid, which he takes to be extravasated sap.

## And the Of Barrenness of Corns and a man the hard and a support of the state of the

CounciCinanni, judging that the queenasts of

The last distemper which I have to speak of is that which Mr. Aimen calls barrenness. The ears of wheat, says he, and also those of rye, are in this case, longer than they would otherwise be, lank and white: in some the membranes are dry, transparent and tough; the semale organs are smaller, whiter, and more downy than in sound ears: in others the vessels are swelled, and all the parts are impersectly formed. Mr. Aimen thinks, as Theophrastus did, that these accidents happen to those plants that grow with most vigour: for in them, says he, the too great quantity of sap in the blades, or other parts of the plants, prevents the blossoms from being duly formed.

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He thinks also that the frost may occasion this accident, by affecting particularly the semale origans; and he is of opinion, that a sudden scorching heat of the sun, immediately after a heavy rain, may produce the same effect. If so, this distemper may be classed with that which renders corn parched or shrivelled, and perhaps too, not improperly, with that of empty ears. According to the same observer, insects are but seldom, shough they are sometimes, the cause of the distemper here spoken of.

Count Ginanni, judging that the barrenness of corn is often owing to the poorness of the soil, rightly advises in this case, to enrich the land and change the seed.

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transparent and tongh; the tenale organs are

that which Mr. Aimed falls barrennefs.

for the selfels are twelled, and all the parts

A MONG the quadrupeds, birds, and vermin which do mischief to the flanding corn, theres and rabbits are accounted the most hureful: rabbits are particularly mischievous, so that the farmer can scareely have a corn-field worse site.

ated than in the neighbourhood of a warren. In hard winters they will go a great way to feed on green corn.

Moles are very pernicious enemies to all hufbandry, by loofening the earth and destroying the roots of corn, grass, and other vegetables. There are various kinds of traps contrived for destroying these vermin, and there are also people who make a trade of catching them, and of clearing grounds of them; while others, watching their motions morning and evening, dig them out with a spaddle; and, about March, which is their time of breeding, numbers of their young ones may be destroyed, by turning up their ness, which are generally in the greatest hills; and the old ones, who come to seek their young, are easily taken.

Every countryman is sensible of the great injuries done by rats and mice; not only to the
corn laid up in stacks, barns, and granaries, but
also to that in the field, where these vermin, and
particularly the field mice, multiply to such a
degree in some places, that it is hardly possible
to destroy them. The means of hindering them
from preying upon corn in the stack, have been
already pointed out, and the means of guarding
against them in barns and granaries, will be noticed hereafter.

As to birds, it is generally allowed, that rooks
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and sparrows destroy much more corn than pingeons; though these are also very mischievous. Rooks are undoubtedly very hurtful at seed time, by pulling it up while young, and also by seeding upon it at harvest. They do most harm, when the snow is first going off from the green wheat, towards the end of winter: for, having been pinched for food during that season, they then greedily pluck up the young plants, in order to come at the remainder of the seeds still adhering to their roots; and are greatly assisted by the loose state of the earth at that time.

Among the many contrivances to frighten them away, Mr. Tull fays, he has found it most effectual to throw up a hat, or tofs a dead rook up in the air. To shoot some and hang them on the branches of neighbouring trees intimidates them much. When the earth is turned up around the trees where they have built their nefts, they will immediately forfake them, and will not return till the grass is grown again. Mr. Lisle says, that taking down their nefts and burning them with their young under the trees they were built in, will make all the old ones defert the place. However, it has been doubted, and perhaps with reason, whether they do not, upon the whole, compensate pretty fully for the mischief they do to erking and he wolfe allegones and along to corn,

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corn, by destroying vast quantities of grubs, worms, and other pernicious infects, in the spring.

Sparrows, though but small, are a very numerous body of enemies, and make sad havock among the corn at harvest time, especially near hedges and villages. Bearded wheat, barley, and rye, are less their prey, than any other grain: a circumstance which may be worth the farmer's attention, in places where his land lies near their usual haunts; for it is better to have a sull crop, even of rye, than to have half a crop of wheat eaten by them, after it has been raised with great care. As they are easily allured to any particular spot baited for them, at the time their sood is scarce abroad, dozens of them may be taken at once, with the large solding sparrow-net.

Partridges, I believe, do no great harm, as they only nip off the tips of the young blades of corn, without scratching or digging for the seeds, and consequently are not very hurtful.

Pigeons, on the contrary, do a great deal of mischief, particularly to peas and vetches, of which they have been known to carry off vast quantities at seed time. As it is unlawful to kill them, the only way is to frighten them, by firing powder only, or by a rattle, or some such noise.

Mr. Mortimer recommends, as a method of hindering birds from eating new-fown corn, to M 3 fprinkle

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fprinkle lime or foot upon it: and he rightly observes with Mr. Worlidge, that moist and warm lands, which are usually the most fertile, are the most subject to vermin in general.

Ants and pifmires, which are reckoned among the pests of the field in hot countries, such as Italy, Spain, and the West-Indies, do much less injury here to corn fields, than to pasture lands and gardens.

These, together with snails, slugs, grubs, or large maggots, worms, and all themore diminutive tribes of insects, are best destroyed by quick-lime and frequent plowing.

Grubs and worms are very prejudicial to land, by eating the roots both of corn and grafs, especially when the corn begins first to shoot.

Grubs lie generally near two inches below the furface, and eat the roots of the grafs fo regularly that Mr. Rack fays he has rolled up many yards of the withered turf as eafy as if it had been cut for a garden. They eat only the middle of the fmall roots of turnips, but by that they kill all they bits without remedy. They live in water and are not killed by fevere frost. Hogs eat them greedily at first, but will not touch them a second time. To rooks and crows they seem a high regale. Salt and quick-lime harrowed in, is the best way of destroying them.

Mr.

Mr. Worlidge fays, a strong lye, made of the ashes or fixed salts of any vegetable will not only deterny them, but prove at the same time an extraordinary enricher of the ground. Perhaps Mr. Worlidge was not aware, when he mentioned this, that the worms themselves thus destroyed by the alkaline lye, are what gives more fertility than the lye itself, and at the same time they provide an animal gelatinous substance for the lye to work upon, so as to prevent its forcing the land too much. He thinks, that sea water would also destroy them.

A small kind of worm sometimes gets into the roots of oats, and working upwards destroys all the inside of the plant, which perishes soon after.

Vermin called vine-fretters, are often found in kitchen gardens. They fix on the roots of leguminous plants, which afterwards gradually turn yellow and die. Mr. Tillet fays, he has observed the same insect in the roots of wheat.

The cuckow-spit, or spring-forth, as it is commonly termed, lodges itself principally in the joints of plants, seldom appears before the latter end of May, and is most common when rain has fallentation a long series of dry weather.

of Analy Indeas, fome a bright real, and others black, which are found in great numbers in the aid.

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ears of wheat. He suspected that they sed on a sweetish juice, which is in the ear while green.

The inhabitants of the province of Angumois in France, sustained, for a long series of years, irreparable losses, by an insect which began to devour their corn in the ear, before it was ripe. This insect is most generally known as a butterfly, very much like the moth which preys on woollen cloths, or the salse-moth which is found in great quantities in the granaries of all countries, and which seeds on corn.

Dr. Fordyce says, there are some infects which infest vegetables when healthy, as the infect which occasions the smut or blackness in grain: this infect is not destroyed by drying; but revives upon being moistened; and if sown with the seeds, will be propagated over the whole field.

In my last section, I mentioned M. du Hamel's doubts about the smut in wheat proceeding from insects; and I there gave an account of a curious experiment upon the sowing of smutty, wheat, which seems to amount to a proof, that this distance is not insectious, as supposed by Drog Fordyce.

Most infects attack, plants, in confequence of a weakness in the plants themselves in the juices in that case being converted into sugar, become proper nourishment for and attract them; but when this

this happens, they afterwards hurt the plant greatly. The happens to the state of t

Each plant is infested by its partioular infects.

The north-east wind is dreaded by the inhabitant of this country, for two reasons; first, because it is more piercingly cold than the wind from any other quarter, with the same temperature of the air, as indicated by the thermometer; and next, as it is supposed to bring with it, in the spring of the year, innumerable swarms of insects, or at least the eggs of those insects. How far this opinion with respect to the insects, or their eggs, is sounded on facts, seems hitherto to have been but little inquired into.

The idea that all living creatures proceed from eggs, or from the feed of other animals, has been fo generally received, that we feldom think of deriving their origin from any other fource: but if, in this instance, we were to consider from whence these eggs of insects come, said to be imported by the north-east winds; we should probably find sufficient cause to doubt of this origin.

Norway, Lapland, and other countries to the north-east of us, countries so early attacked by severe frosts and so soon covered with deep snows, which continue till late in the next spring; can it be imagined, I say, that any thing which has noticed.

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the principle of life in it, can be supposed to cross so considerable a breadth of sea, and assume life at so early a season as these animals are first perceiveable here? Unless this difficulty can be obviated in a satisfactory manner, we should inquire whether the origin of these distinctive insects may be rationally sought for, from some cause existing in our air, and in the vegetables so apt to fall a prey to such insects.

The Count de Buffon is the first among the moderns, who has ventured to differ from this generally received opinion; and has assigned a probable cause for so doing. Without entering at large into his reasoning, let us ask with him, whence arise the animated appearances in mixtures of animal or vegetable matter, when insused in any sluid? It seems, says he, that the first cels that appear in paste, are certainly not produced by other cels. By cutting them with the point of a lancet, we discover smaller cels issuing in great numbers out of their bodies.

On this principle, let us attend to the state of our vegetables in spring, and to the effects that a cold north-east wind may have on them. There is no appearance of any such insects, till the circumstance of the such and the such as the such as

culation

Puffon's Natural History, Vol. II. p. 322. Parts Edition in

culation of the fap in spring begins in the vegetables most likely to be preyed on by them. When the fap is put in motion by the first warm weather, and the buds begin to fwell, the sharp north-east wind checks the motion of the fap in the capillary veffels; and when the fap is again put in motion by the return of warm weather, more fap arrives at the obstructed vessels, where being accumulated, it bursts these vessels and corrupts, thereby giving rife to infects; as is the case with the eels in paste; and as more sap is daily added, a matrix is formed for an innumerable race. This origin of infects is confirmed by those of different plants, being different; whereas, if they had been imported by the north-east wind, there must, at the least, have been a great fimilarity amongst them. That the infects are different, from the juices of different plants, may be feen from diffolying in water a paste made of the flour of each plant.

In order to corroborate this system with respect to the origin of insects in plants, I shall again have recourse to the well known science and accuracy of the Count de Busson, who tells us, That when large quantities of the organic and prolific matter are collected in some part of an animal, where it is obliged to remain, it there forms living creatures, which have always been regarded

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regarded as real animals. The Tænia, the Afcarides, all the worms found in the veins, in the liver, in wounds, in pus, and most of those which are formed in putrid flesh, have no other origin. The eels in paste, in vinegar, and all the pretended microscopic animals, are only different forms assumed by this active matter, which has a perpetual tendency to organization\*".

This much, concerning the origin of infects, I thought it necessary for me to mention here, as throwing some light upon a subject hitherto so little understood; and whatever utility it may be of, or to whatever farther discovery this may lead. I think it proper for me to say, that the reader is indebted for these hints to my much esteemed and ingenious friend Mr. Small, who first communicated to me his ideas upon this interesting subject.

Mr. Green, of her Majesty's gardens at Kew, was the first person who invented a fort of bellows, by which he blew the smoke of tobacco upon the infects that infest hot-house plants, and by this method he succeeded in destroying them completely: but this mode of attack cannot be applied to the plants of an extensive field, and therefore other remedies, such as I have already mentioned in several parts of this work, must be

<sup>•</sup> Idem, Vol. II. p. 422 and 423,

reforted to. I shall however have occasion to take notice of the use of tobacco in another shape, when I come to speak of the culture of hops.

# THE THE SECTION III.

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# of WEEDS.

THOUGH the drill husbandry is doubtless far superior to the broad-cast method, in many respects, yet there is no circumstance which gives it a more decided advantage, than the facility of weeding and keeping ground clean from every plant, except that which is sown upon it, and is the present object of culture. For every vegetable that grows in a field, differing from the particular plant that is intended to be cultivated, may properly be termed a weed.

So much has already been faid upon the great utility of the horse-hoe for this purpose, that it would be tiresome and trisling to repeat it here. But even in hand-hoeing, it gives a great advantage, by the plants being in rows, and consequently not only cleaned more expeditiously and cheaper,

cheaper, but also at an earlier period of their growth being easier distinguishable from the weeds, than when scattered at random over the field. Thus, in the former way, the first hoeing may be very profitably given to wheat, in the month of October, but in the broad-cast method it would be difficult, and even dangerous to venture upon hoeing till the spring following, when the plants are more grown, and more easily distinguished from the surrounding weeds.

Frequent weeding is attended with feveral good effects; it loofens the earth round the roots of the plants, it cuts off those rivals which are struggling with them for nourishment; it opens spaces for the freer access of air; and the weeds thus cut down, and rotting in the earth, furnish fresh mucilage to the remaining plants. It is from the neglect of this most material point, that we often meet with lank half-starved ears, which afford only meagre, shrivelled, spotted, unwholesome grains, disagreeable to the taste, and not half so full of flour as those of found corn.

The best time for weeding by hand is, after a gentle shower of rain has moistened the surface of the earth; because the weeds are then most easily drawn out with their roots, which are apt to break when the ground is too dry; and in this case the remaining pieces, particularly of those which

which are of the creeping perennial kind, will foon produce new shoots, which will become as hurtful as the old ones.

If the spring is wet and warm, and if it rains much in May, abundance of weeds will then shoot up; and great care should be taken to destroy them immediately. The mild showers which are sometimes almost continual in June, produce the same disadvantageous effect.

Then it is, particularly, that every species of the bind-weed shoots up with vast rapidity, twirls itself round the corn, reaches its topmost height in eight or ten days, and drags it down, so as to deprive the ears of all further sustenance.

Only the warm rains in June, and not the cold ones, engender this noxious production: particular care should therefore be taken to pluck up all weeds, and especially this, in April, May, and June: otherwise there will be danger of reaping straw only, instead of corn.

Of the perennial rooted weeds, which are best destroyed by repeated summer fallows, wherein it is effentially material that every piece of root be taken away and burnt, because in many of such, every joint will produce a new plant, the most hurtful to the farmer, and the most apt to abound are the hourself.

Bind-Weed, by fome called the Withwind (convolvulus),

(convolvulus), of which, considered as a weed, there are two principal forts, the great and the small. Its root is perennial, but its stalk annual. Mr. Lisle, after observing, that he believes it propagates itself in pasture ground, chiefly by its feeds, and by its roots in arable land; because it feems to flower too late in corn, to feed before the corn is cut; rightly affigns as a reason, why it is most apt to multiply in strong clayey soils, that fuch ground being, in the common practice, plowed only in the winter months, after wheat, for fuch other crops as peas, barley, or oats, and not till about September for winter vetches; this tillage cannot deftroy the roots or feeds of weeds like the fummer fallows for wheat; but on the contrary, promotes their increase, particularly from the off-fets or joints of the roots.

In an open clear spot of ground, good plowing and harrowing, or carefully hoeing down of these weeds as they rise, during three or four months, may extirpate them effectually; for when the stalks are broken or cut, a milky juice flows out, and the roots are thereby soon exhausted and decay. The roots of this fort are pretty thick, and extend far on every side.

Blue Bottle, which some call knap-weed, and others centaury (centaurea). Many of the species of this genus, of which Mr. Miller enumerates twenty,

twenty, have perennial roots; but our common blue-bottle, according to him, is an annual plant. It propagates itself by its seed in corn-lands, in which it most abounds, especially in a gravelly soil, From an old notion of its being good for seabs, seald heads, &c. some have given it the epithet of scabious. It slowers in July, and its seeds ripen in autumn.

Spating-Poppy, or Berry-Bearing Chick-Weed (cucubalus), flowers early in the fpring, and, if it be fuffered to grow, several times in the course of the year. The way to destroy it therefore is, to pluck it up from time to time, before it can shed its seed. This is a very rambling weed, natural to most parts of England.

Its roots are perennial, and strike so deep in the earth, that they are not easily destroyed by the plough; for which reason, bunches of this plant are too common among corn, in land which has been persectly well-tilled. Summer fallows and careful harrowing out the roots, will here prove the most effectual remedy.

Cockle (agroflemma birfuta), the feeds of which are black, having a white meal or flower. The feeds are not cafily separated from the grains of wheat because they are heavy.

Sifting and throwing the corn on a large floor,

are the best ways, of clearing the corn of these seeds, land as a min or guidance action and

The cockle is best extirpated in arable land, by summer fallows, good harrowing, and care, fully removing every bit of its long creeping, perennial roots, which would soon produce new plants if lest on the ground, and should therefore be burnt when taken off. The horse-hocing stucked will soonest and most effectually destroy this weed.

Colts-foot (tuffilago). This week, which delights to grow by the fides of rivers, increases fo fast by its feeds and rambling roots, every piece of which will produce a new plant, that di cannot be extripated without much difficulty and a confiderable time. Carefully pulling up the roots every time the earth is ftirred, on the least vestige of the plant appears, and preventing it running to feed, are the most effectual means of destroying it in arable land, land is best accomplished by the horse-hoe of but to extirpate it totally, the ground must be long laid down to grass.

A neighbour of Mr. Lifle's almost destroyed it by two successive crops of vetoles; and he him! felf is clearly of opinion, that it may be killed by letting the land lie a sufficient time under clover or rye grass, because, says he, the roots of the natural grass matting more and more every year,

will

will in five or fix years, fo bind the furface of the ground that the colts-foot will not be able to pierce through it, and therefore die for want of air. He plowed up broad clover in the beginning of July, and turned up the roots of colts-foot in which he observed between earth and air many little buds that forth probably to be the leaves or flowers for the next year; and at the depth of fix or feven inches, he remarked here and there a shoot of a callous body; like the root itself, from one to four inches long, perhaps destined to be future roots. He experienced that a winter-fallow will not destroy these roots, and that they cannot refift the effects of a fummer's fallow, in which they are turned up to the fun. It is therefore necessary to pick them up as clean as possible, and burn them: for it is not to be supposed, that all the roots which are turned up in a furnmer-fallow, will wither of themselves : on the contrary, such of the buds at the joints, as are buried, and even many of those which only touch the ground, will shoot out again if much rain falls, or the feafon be weelf drain and to the contract of the contract of the contract

Corn-flag (gladiolus). This multiplying exceedingly by its roots is a very troublefome weed, in arable land, and is extremely difficult to root out. The manner of extirpating it, is the fame as for colts-foot.

EVERY

Corn Marygold (chryfanthemum) Of this there are two kinds; that with leaves which embrace the stalks, the upper being jagged and the lower indented like a faw; and that which C. Bauhin names the greater wild daify, with a leafy stalk! The former of these is the common corn-maria gold, too frequent among corn and in the borders of corn-fields. The latter, which delights more in moift pastures, of which few are without it in this country, rifes with stalks near two feet high, gara nished with oblong indented leaves, which embrace the stalks with their base. Each of these stalks is terminated by one white flower, shaped like that of the daify, but four times as large. It flowers in June. The corn-marigold has a perennial woody root, which strikes deep, and requires a confiderable quantity of nourifhment, and must therefore be a great enemy to corn. Confiderable pains must be taken before this weed can be extirpated, as it is highly probable that befides multiplying by its roots, its feed will grow if plowed in, as that of the garden-marigold does. Deep and repeated hoeings are therefore necessary, before it runs to feed.

Dog-graft, as it is frequently called, (triticum expens) is one of the worst of weeds among corn, and one of the worst to extirpate in arable land;

every joint of its long creeping roots being capable of foon producing a new plant, even after those roots have been cut and broken by the plough. The usual method of destroying it is by laying the land fallow in the fummer, and frequent harrowings to draw out the roots, all of which should then be burnt, to prevent its grows ing again. Where this is carefully done, the ground may be so well cleansed in one summer, that the remaining roots will not do any great injury to the crop: but the best way is, to fow the land in which this weed prevails, with fuch things as require the horse-hoeing culture. The blade of this grafs is fo rough, that cattle will not feed upon it when green. I share a state and shared a state

Corn Scabious (scabiofa arvensis), has a strong thick fibrous root, which runs deep into the ground, and fends out feveral branching stalks, which rife three feet high. The lower leaves are fometimes almost intire, and at others, they are cut into many fegments nearly to the mid-rib: they are feven or eight inches long, and from three to four inches broad in the middle, hairy, and fit close to the root. The stalks are covered with stiff prickly hairs, and garnished with smaller leaves at each joint. The flowers, which are of a pale purple colour, and have a faint odour, appearin June, upon naked foot stalks at the ends of hedres

the branches, which decay to the root every au-

The Dock (rumex), of which there are feveral forts, is so remarkable by its large leaves, that he must be a very slovenly farmer who suffers it to grow to any size. If he is careful, he will pluck or cut it up as fast as it appears, which he may easily do when the land is moist, it being of the tap-rooted kind.

Dyer's Weed, or Wild-Wood, by some called Weld, or Bastard-Racket, (refeda), is a troublesome plant, when confidered as a weed. Its root is long, white, and fomewhat woody; its leaves are unequally winged and intire; its stalks, which are channelled, and garnished with smaller leaves. rife a foot and a half high, and are terminated by a long loofe fpike of pale yellow flowers, which are fucceeded by a triangular feed-veffel, filled with black feeds. This is a biennial plant, which flowers and feeds the fecond year, and perifhes foon after. It is observed to make the milk of cows bitter, and to communicate the fame ill tafte to the butter and cheefe. Of this genus is the woad very profitably cultivated for dying, and which will be spoken of more fully hereafter.

Ground Ivy (glichoma), is one of those trailing plants which strike out roots from the joints of their stalks: but as it generally grows under hedges

bedges, or on the fides of banks, the falutary effects of its medicinal qualities more than compenfate for the injury it may do.

May-Weed, or Morgan, a wild species of camomile (authemis), is a trailing perennial plant, which puts out roots from its branches, as they lie on the ground; by which means, and by scattering its seeds long before corn is ripe, it spreads and multiplies greatly. It flowers in May, from whence its name: though fome have improperly given this name to the colula fatida. which feldom bloffoms till late in June. The means of extirpating it are, fummer fallows, repeated good harrowing, and burning the collected roots, as before directed; or, which will be found still more effectual, the frequent hoeings of the drill husbandry. What escapes these cleanings should be carefully pulled up by hand, when the ground is tender; for this plant has a long slender tap-root, of which every remaining bit that has a knot in it, will produce new shoots. Nor ought the farmer to regret this small additional expence to get rid of one of the most fatal enemies his corn can have. Mr. Lisle affures us, that as good a crop of wheat as one would wish to fee all the winter time, was, to his knowledge, so defroyed by the coming up of May-weed and pop-

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pies in the fpring and fummer, that it did not at last yield so much as the feed.

Mugwort (artemifia), is a most troublesome weed; for its roots creep far under the surface of the ground, so as soon to overspread a large space, if they are not slopped; and its seeds, being light, and easily carried to a distance by the wind, will produce numbers of new plants the next spring. It has plain cut leaves, woolly underneath, and single spikes of plain yellow oval slowers, which blow in June.

Mullein (verbascum), is a biennial plant, which perishes foon after it has perfected its feeds. The lower leaves of the common fort, which is the species here spoken of as a weed, though it be that which is used in medicine, spread on the ground, are nine and ten inches long and fix broad, very woolly, of a yellowish white colour, and have scarce any foot stalks. The stem rises four or five feet high, and the upper part of it is garnished with yellow flowers, which fit very close, and form along thick fpike. These flowers have an agrecable odour. They appear in July, and the feeds ripen in autumn. This plant is most common by the fides of high-ways, and on banks; but if it once gets into fields in a warm exposure, and is fuffered to feed there, it will foon over-run the whole

whole ground. It may easily be destroyed by cutting off the stem when it is in flower.

Nettle (urtica). The largest fort of this well known stinging weed is perennial, and the smaller fort is annual. Tolerable good cordage has been made of the threads or filaments of this plant, treated as hemp. They are strong and tough, and certainly afford great room for further improvements of that kind, well deferving the attention of the curious who direct their views to objects of public utility. Cutting it up by the root before it can feed, is the way to destroy it.

Silver-Weed or Wild Tansey (potentilla), is a fpecies of cinquefoil, which grows naturally on cold stiff land in most parts of England, and is a fure mark of the sterility of the foil. Its stalks foread upon the ground, and fend out roots from their joints; by which means, and by the frequent shedding of its seeds, for it flowers during the whole fummer, it foon over-runs and fills the land to a great diffance.

The leaves of this plant are composed of many lobes or wings, which are generally placed on the mid-rib, and terminated by an odd one: they are jagged at their edges, and are of a filver colour, especially on their under-side. The way to defroy this kind of growth has already been pointed out. Mr. Ray fays, that the root of wild tanfey, TIENIS

which

which is formewhat of the parfnep kind, is good to eat, and that hogs are very fond of it.

Thisle, (carduns). The English thisles me-

- 1. The Carduns Lanceolatus, or Spear Thiftle.
- 2. Gerduus Nutans, or Musk Thistle.
- 3. Carduns Palustris, or Marsh Thistle.
- 4. Carduns Marianus, or Milk Thiftle.
- 5. Carduns Acanthoides, or Welted Thiftle.
- 6. Carduus Crifpus, or Curled Thiftle.
- 7. Onopeidum Acanthium, or Cotton Thiftle.
- 8. Seratula Arvensis, or Cursed Thistle.

Of these, all except the last, are either annual or biennial, that is, remain in the ground not more than one or two years, unless renewed by seed. The last having a perennial root, continues in the earth increasing, and throwing up new shoots every year.

Hence it will appear obvious, that if the first feven species of thistles, are cut down before they perfect their seeds, the ground will be intirely cleared of them; and that the last mentioned can no otherwise be destroyed than by rooting it out.

It is more general in its growth than any one of the others, being found not only by the fides of roads univerfally, but also in arable land; and is not uncommon in meadows, even in such as are yearly mown. It is remarkably prickly, grows about about three feet high; its heads are fmall, the flowers purple, and frequently white. The scales of the heads are smooth, and it may in a particular manner be distinguished from all the others, by having a perennial root about the size of a goose-quill, which runs deep into the earth, and afterwards creeps along horizontally.\*

Wherever thistles grow naturally, it is a sure sign the land is strong: but at the same time they are a great annoyance to every plant intended to be cultivated.

The best way to destroy them is to cut them up by the roots before seeding time, which is in autumn; for cutting of them too young, will only make them branch the more: or to pluck the thistles up by hand, when the ground is moist and tender. They may then be easily drawn up with their roots, by using a glove made of hard leather.

Mr. Arbuthnot effectually destroyed them by another method: he having observed that rolling in the spring while the land is wet was fatal to the crop of grass, determined to try its effect upon the thistles; he did so accordingly, and the effect was so great, that after that operation scarcely one thistle appeared, but the crop of hay, where they were, was speilt. Rolling in dry weather had not the same effect.

abud William Curtis in Beth Sec. Trans. Vol. I, p. 100.

Mr. Winter, in his Compendium, fays, thiftles may be destroyed by cutting in the spring and sowing wood-ashes over the bleeding wounds: perhaps hot lime might be more effectual.

Of the weeds propagated by their feeds, which ripen either before, or with the corn, and which fow themselves, or are gathered with it, the following are most to be feared.

Darnel-Grass (lolium). There are two species of this grass, one perennial, which is most commonly found by the roads, or in pastures; the other is found in arable land, where it grows to a great height, bears a feed nearly as large as wheat, which it resembles, and is therefore difficult to separate from the corn. This however ought to be done as carefully as possible, as it discolours the flour, and gives a disagreeable taste to the bread. These seeds are said to be of a very intoxicating quality and if taken in large quantities will bring on convulsions.

This weed is extirpated by fallows, and the horfe-hoeing hulbandry.

Chickweed (alfine), though but an annual plant, will foon become very troublefome if it be suffered to stand till it sheds its seeds, which Mn Liste thinks it does several times in the years for he observed on the 23d of October a great deal of this weed, the branches of which carried many buds

buds of bloffoms, many flowers full blown, and many pods with white feeds almost rips; so that its increase can be the less guarded against by any fort of husbandry in the common way. The respected horse-hoeings in the new husbandry must here be attended with great advantage; at all events particular care should be taken, to prevent the seeding of this plant upon dung-hills, where it is too often suffered to grow unnoticed, and undisturbed if for its seed scattered there and intermixed with the dung will soon give birth to a multitude of weeds in the land on which it is spread; unless the dung be kept till the seeds are rotted and have lost their vegetative power.

Charlock (sinopis arvensis), the young plants of which are so very like those of young turnips, as not easily to be distinguished but by the taster the charlock being hot and bitter, and the minip mild.

Mr. Liste observes, that cold wet lands are more subject to charlock, than white land; because, says he, the charlock seed, being very oily, resists putresaction, and is not easily opened or penetrated by moisture; whereas white and light earth is soon dry after rain, and the water does not continue so long as to make such seed germinate so effectually as in the other. Mr. Mortimer mentions his having been told, that a farmer who had wast

waft quantities of this weed in a field of barley, moved the whole, when the charlock was in flower and ready to feed, which is commonly about the middle of May, as low as he could, without taking off more than just the tops of the blades of barley, and that this killed the charlock and gave the corn an opportunity of getting above it in such a manner, that he had four quarters of barley on an acre. He adds, that where a fallow is full of charlock, it will be right to turn in sheep, for that they will eat it very readily. I have heard, that it was common in Holstein to give charlock to horses, either green, dried, or its feed mixed with oats; that then cattle are fond of it, and that it is found to be very hearty food.

Foxtail, is a pernicious weed in many countries. Its feed is formewhat like wheat, and is faid to spoil the meal with which it is ground, by giving it a dark colour and bitter taste, rold of the state.

Mr. Miller fays, it is delicious food for cattle, particularly for fattening of oxen and cows, and that it may be worth while to cultivate it for this purpose.

Its feeds feldom grow the first year, unless they chance to be fown, or to sow themselves in the autumn, soon after they are ripe. It is a large plant, bearing a spike of purple flowers, with nu-

merous

merous floral leaves of the same colour. This is not a common weed in arable land, but is frequently found in mountainous pastures and woods.

Pennel-flower (nigella), and Penugreek, (irea gonella), abound in warm climates, but are not very common here.

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The Groundfil, (Senecio Vulgaris) is a finall annual plant, feldom visible during more than two or three months in the year of the sear of the search of

It comes to maturity in about a month, fows itfelf and dies; fo that like all other weeds of this class, whose seeds ripen before or with the corn, or which sow themselves, it is easily extirpated by preventing its seeding.

Hare's foot Trefoil (trifolium gruen/e), abounds most in dry gravelly land, and is a sure indication of the sterility of the soil; for it is rarely seen on good ground. It is an annual plant, whose root decays soon after it has perfected its seed; and so coarse that cattle seldom eat it. Another species of tresoil, which is apt to infest arable land in many parts of England, is distinguished by the name of Strawberry Trefoil, and has trailing stalks which put out roots at their joints. The leaves stand upon long slender soot-stalks; the lobes are roundish

roundish and sawed on their edges; the slowers are collected in roundish heads, standing on slender foot-stalks, which rise from the wings of the stalks; and these have bladder empalements which terminate in two teeth. When they lie on the ground, their globular head, having a little blush of red on their upper side toward the sun, and the other part being white, they look not unlike strawberries; and from thence this kind derives it particular name.

Melilot, (Melilotus) commonly used in media cine, is of the trefoil kind, and grows in fuch abundance among the corn in many parts of England particularly in Cambridgeshife as to be a most troublesome weed; for it is hardly posfible to feparate it from the corn in reaping, fo that they are housed together, and the seeds of the nielilot, which ripen about the same time as the corne are threshed out with it, after which, they being likewife heavy it is very difficult to feparate them. If but a few of these seeds are ground with the corn, they will spoil the flour, for the bread or whatever elfe is made with it, will have a ftrong tafte and fmell like melilot plaister. The roots of this plant are firong and woody, and from them: fpring feveral stalks, which rife from two to four feet high according to the goodness of the land. These stalks branch out, and are garnished with trifoliate dibattor

trifoliate leaves, having oval fawed lobes of a deep green colour. The flowers are produced in long flender spikes, which spring from the wings of the stalks. They are of a light yellow, shaped like the other buttersly slowers, and are succeeded by naked seeds, which ripen in August.

Corn Spurrey (spergula arvensis), is a common weed in many parts of England. It feldom rifes above fix inches high, flowers in the beginning of July, ripens its feed in August, and is an annual plant. The way therefore to extirpate it is, by firmither fallows, and cutting off before it can featter its feeds, which are very fmall. Two fper cles of this plant are cultivated in Holland and Flanders for the winter food of cattle, when there is a scarcity of grass. It is faid to enrich the milk of cows, fo as to make it afford excellent butter; and the mutton fed on it, is frequently preferred to that which has been fed on turnips. Hens too eat this plant greedily, and it is commonly thought to make them lay an extraordia mary number of eggs. From the fhortness of its growth, this plant cannot afford a great quantity of fodder, but as it will grow on the poorest land, where no other grafs will thrive fo well, it may be cultivated to good advantage in many places and by feeding it off the ground, the dung of the cattle will improve the land. The people in - Vor. II. the

the Low-countries commonly fow it twice a year; the first time in April or May, to be in flower in June and July; and the second time after rye-harvest, to serve their cattle in November and December. The usual allowance with them is, about twelve pounds of seed to an acre of land.

The great advantage of spurrey as fodder is, that it requires no preparation in the land, but harrowing, then sow the seed in a rainy day, bushharrow, and it will shoot up on the sourth day.

Wild-garlick, Crow-garlick, or Cow-garlick, as some call it (cepa), will do great damage to corn in dry sandy grounds, but will not grow in clays, according to Mr. Lisse, who mentions a sarmer, in some of whose fields it grew in such abundance, that his wheat tasted strong of it, and was thereby damaged from six-pence to a shilling in the bushel.

Wild Oats are difficult to be extirpated, when they have once taken possession; for ripening before harvest, and scattering their seeds around them, they will remain in the ground till it is plowed up again, though it be for a whole year, some say four or sive years, and will then come up with the corn. The surest way to destroy them is to lay the ground down to clover, and to mow the oats and clover together, before the oats are ripe. Their roots will not shoot out again.

Wild

Wild-poppy, or red weed (papaver erraticum), common in almost all arable lands, but most fo in the lightest. It is an annual plant, which fometimes multiplies fo prodigiously by its feeds, that it choaks the wheat among which it grows. There are three kinds of this poppy, a red, a deeper red, and a copper-coloured, all of whose flowers are fucceeded by oblong prickly heads filled with small black feeds, which fow themfelves if they are fuffered to stand. from anim vo

Wild vetches (vicia segetum), are great enemies to corn wherever they prevail, and especially if it happens to be lodged; for they then foon get above it, keep it down, and thereby contribute greatly to its rotting. Too much care cannot be taken to extirpate them, by preventing their feeding, arraticount and allower to flower and another of

Black-bent, in some places called mouse-tail, is more difficult to extirpate than many other annuals; but Mr. Arbuthnot found the following method very effectual. Plow up the stubble in September, and leave it for the winter: in fpring pulverize the land, as foon and as fine as possible; fo let it remain for the bent to vegetate; then plow it up and fow fummer tares, or any thing that comes off foon enough to leave time for plowing it well before winter. Lay it up on the ridge, to be secure from rain: if the black-bent TO THE LA

springs again, plow the whole surface of the land with the shim, after which harrow, and leave it for sowing wheat under surrow, shallow and very late. This method is also good for the destruction of all seed weeds, if no couch is in the land drilled crops, by admitting the hand hoe, are excellent for destroying this weed.

Weeds are very different in their natures. Some, if prevented from vegetating, die in a few years, by lying moist in the earth, others will lie many years in this situation, without losing the power of vegetating.

The first kind may be destroyed by laying down the land to grass for five or fix years; and both kinds may be rooted out by allowing them to vegetate, and then tearing up the young plants before they begin to flower. In order to promote the vegetation of weeds that are intended to be destroyed, the land ought to be well plowed; if a little dung or other manure be applied, the crop of weeds will be increased, and their defruction will be rendered more general.

Several weeds, as the thiftle, dandelion, ragweed, &c. are furnished with a kind of down, by which they float in the air and are carried to great distances by the wind. Farmers should be as careful to root out all weeds of this kind from hedges, banks of sences, and brows, &c. as from their their arable land; for though they appear inoffentive in those stuations, they are transported from thence in great quantities into the adjacent field, by the wind was a substant of visite and or of

little attended to by farmers, at which I have all ready hinted. It is a general practice, to throw the deeds that are separated from the corn in winnowing, upon the mixen; by which means they are carried out with the dung, and again sown upon the land.

are propagated by the roots, as I have already taken occasion to remark. Some of them infest land that is in tillage, and others, land that is in tillage, and others, land that is in tillage, and others, land that is in

Those that infest land in tillage, may be destroyed by laying down the land to grass for some years. This is thought the most effectual way of rooting out the couch grass and other weeds of the same nature. If the foil be stiff and strong, it will be the sooner cleared by this method. But a soft springy soil will require to be in grass for liex or fever years, before the weeds are destroyed. It shall weeds that infest lands in grass, are easiest destroyed by rillage. Neither is it necessary to continue it long in this situation, souther weeds soon disappear by this treatment.

SECTION

In some cases, however, it may be inconvenient to change the state of the land from tillage into grass, or from grass into tillage. It is therefore necessary to consider, whether the destruction of the weeds may not be accomplished without these operations.

When land is in tillage, the weeds may certainly be destroyed by summer fallowing, plowing deep, and carefully carrying off the trumpery, that it may not again strike root.

When it is intended to clear land of feed-weeds, the surface cannot be made too smooth; because it will encourage them to vegetate. But when root-weeds are to be destroyed, land cannot be laid too rough, because the drought has the more easy access to those roots which are to be dried and withered.

When grafs lands are infelted with weeds, the best way to destroy them is by frequently cutting, or pulling them up by the roots. Some lands, particularly damp foils, after being in grafs for years, are apt to be over-frun with moss. In this reale, rolling will be of great use, by making the first face firmer. This weed, like many others, may be destroyed by depriving it of air. This is best done by manuring well, for the grafs will then rife above and chook it.

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## SECTION IV.

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## Of FALLEN, or LODGED CORN.

bunished a grain of the bound of the bunished and the bun

HE finest, tallest, and strongest plants, are not always those which yield the greatest quantity, or best grain. The stems of corn grow and shoot up pretty perpendicular, unless this order of nature is subverted by some accidental The most frequent causes of this kind, are wind and rain. The stem, which is supple, bends indeed, and thereby gives way to the force of the wind; and by means of its elasticity, it recovers its erect position upon the ceasing of the wind, having received little or no injury: but when much rain accompanies the wind, the ears of the corn become loaded with wet, and the stalks, which are tender near the ground, break; the plants cannot then rife up again; and if there be weeds at the bottom of the stems, they will foon top the corn, and effectually prevent its rifing. If the accident of their being lodged and broken, happens foon after the ears have done bloffoming,

bloffoming, the grains, which then receive but little nourishment, remain very small, and contain little else but bran. In this case the loss becomes very considerable; for, besides the injury sustained by the grain, the very straw rots, and is rendered unsit for the food of cattle.

If the corn be not lodged before it is almost ripe, the grains will then be only shrivelled, and a tolerable crop may be reaped, if the time of harvest proves warm and dry: but if it be rainy, such corn will be very apt to grow in the car.

Laftly, if too high winds happen when the corn is ripe, its grains will thed, and its flatks will be entangled, to the great detriment of the farmer. and to the no small trouble of the reaper, however careful both of them may be. Corn only bent rifes again. In this fituation, the plants continue to grow, their ears increase; and become full of grain, which fornetimes is not even thrivelled. What is most to be feared, is that birds may perch upon it, in this fituation, and by their weight may contribute to lodge the plants. Were it not for this, the bending might even be of fervice to it, because wer cannot ger into the ears, and their grain will be fittest for keeping, "The bent ears will also be least liable to be shaken by the wind; the greatest danger is their bending bloffouniag.

more and more till they reach the ground, and, by lying moit, begin to fproute a sit of grown

If the hulbandman could forefee when a feafon is to be very favourable for the growth of corn, which is not, indeed, the lot of humanity, he would doubtlefa forbeat to entich by manure his already good land, and thus prevent an over exuberance of growth, and a tendency to lodge. In the pear 1761, the low corn produced finer and better grain, than the stalless and at first most promising, to some fine out of such lie no believe

As foon, therefore, as the farmer perceives this approaching evil, he thinks of two ways of preventing it; either by mowing down his crop, or by turning in sheep to eat down the too hunuriant blades; but both methods are dangerous, and ought only ited be exercised in cases of great necessity, and even then with much caution. The farmer, by these means, tuns a great risk of leffening his crop, or reducing it to the level of a second growth, where the cars are always small and light. Besides this, the grain is better when it ripeas early in the scason, but by checking the growth, and retarding the ripening, corn is thus exposed to all the inconveniencies of a late harvest.

It is agreed, that corn which grows in a rich foil is taller, and more liable to be lodged, than

india.

that which is stunted in its growth. But this is owing to the weakness of the straw, and not to the weight of the ears, let them be ever fo full of grain. The business therefore is, to give the ftems as much ftrength as possible. To this end. it is necessary that the fun and air have free accefs to them, and that the plants receive fufficient nourishment while in the earth; for we frequently fee tufes of wheat, which chance to grow separate from others, and fland in fuch a manner as to be exposed on all fides to the influence of the air and of the fun, much less apt to be laid than those which grow in the middle of large fields of corn. In the common hufbandry, the plants generally have but a scanty portion of food; and as their stalks stand close together, smothered and stifled as it were, they are flender and brittle but in the new hufbandry, where they receive abundant nourifhment during the whole time of their growth, and are always exposed to the air and fun, the stalks become large and strong enough to support the ears, Many experiments in this hulbandry have likewife proved, that the turning the earth towards the roots of corn at the last hocing, contributes greatly to give stability to the flems after they have attained their height, and renders the corn less liable to be lodged.

M. du Hamel had a remarkable instance of this

in the year 1750, when a field of his fowed in rows and cultivated in the new way, which made the wheat there grow very tall, and rendered its ears uncommonly large and full of grain, escaped unhurt; whilst the corn was beaten down in most of the neighbouring lands.

It will not, I flatter myfelf, be thought an improper digression in this place, to take a cursory view of the teconomy of plants, from which we shall see more clearly the uses and properties of their roots and leaves, how they contribute to their nourishment, and how necessary for that purpose, is the free admission of rain, air, and some office of the free admission of rain, air, and some office of the free admission of rain, air, and some office of the free admission of rain, air, and some office of the free admission of rain, air, and some office of the free admission of rain, air, and some office of the free admission of rain, air, and some office of the free admission of the received of the free admission of rain, air, and the received of the received

The principal velfels of plants are of two kinds,

The Tubes run from the roots to the different parts of the plant, in separate bundles, communicating with one another, but not joining and branching as in animals.

These tubes contain principally the muellagenous and faccharine juices, serving for the nourishment of the vegetable. The tubes, being capillary, if empty and immersed in water, or any
other study, have a power of filling themselves
by the attraction of the sluid to their sides; but
this will not by any means account for the circulation in vegetables; there is therefore a power,
similar

similar to the implicitlar poweroin animals, thy which this motions at idash impart, and all the other motions of livegetables, are performed. The Colls contain the peculiar juices of plants; and on the pobably these are formed in them by fermentation: they communicate with the tubes, or rather, the tubes terminate in them.

which are only open at the extreme points of the fibres, and fluids cannot be absorbed by them any where elies of the fibres, but there is a particular configuration which adapts them to absorbe forb fluids; so that if the ends of all the fibres of the roots of any vegetables be cut seff, the growth of that vegetable is stopt, till fresh fibres are formed in add of story of any vegetables he cut seff, the growth of that vegetable is stopt, till fresh fibres are

More numerous fibres may be made to break out by a fufficient tenacity of the foils by richanels of foils by dutting the fibres in which cafe they do not go on but branch out into new ones by poisoning the weak, fibres, and by outsing the branches, so improve energy year yet on live side

But the fibres are rendered too weak for the

fupport of the plant, by too great tendeity of the foil; by applying poison in too greats a quantity, and by dutting the branches too much smoo

As roots can only abforb nourithment from the points of their fibres, the cells furrounding them ferve to defend the tubes from water, which they do if the foil be moderately dry; but in very moift foils, the water foaks through to the tubes, ftops the circulation in them, and rots them. The roots of fome plants will bear a much greater quantity of moifture than those of others.

In trees and shrubs, the stems which are above a twelve-month old are to be considered as roots, having the same structure.

At that part where the root is converted into a flem, the tubes divaricate and are placed on the outfide; being covered only with a thin bark, which is of the same texture and answers the purposes of the leaves; the cells forming the pith being contained in the middle.

Water constantly evaporates from the leaves and the bark of the stem, and carries along with it the volatile parts of the juices, and some small portion of the more fixed; but they attract water from the atmosphere at the same time, so as in some cases to nourish the plant totally; and the roots also throw out a part of the juice into the ground. There is a considerable difference betwixt

twixt that which evaporates into the air, and that which exfudes into the ground; as the former contains water, with the effential oil of the veges tables; and the latter, the mucilagenous juices.

The excudation from the roots takes place in the greatest quantity while the leaves are flourishing; hardly any thing flowing out after they begin to decay. Secondly, in plants that are moderately succulent; and thirdly, in perennial plants, at the time of the flowing of the sap.

Seed confifts of the hulk, a membrane covering the other parts; of the cotylidons and one, two, or three maffes of farinaceous matter; of the embryo, i. e. the young plant, confifting of a radicle and plumule.

The embryo lies in a dormant state, i. e. alive, but not exerting its life, until it be put in proper circumstances, which are, of heat, moisture, and exposure to the air.

It requires different degrees of these, to make different seeds grow.

First, if a seed once begins to grow and is stopped, the embryo dies. Secondly, the embryo may also die from age, i. e. if the seeds are kept too long; and in some seeds, this happens in twelve months, in others not in twelve years. Thirdly, it may be destroyed by insects. Fourthly, it may undergo fermentations from moisture;

or, Fifthly, it may be killed by poisons. In all these cases, the vegetation of the seeds is destroyed.

When a feed is put in the proper circumstances for growing, the farinaceous matter in the cotylidons is converted into sugar, the embryo swells, and the radicle pushes forward till it gets through the husk, and afterwards runs perpendicularly downwards, till it breaks out into sibres. These sibres run in different directions, but never penetrate above a certain depth from the air.

When the radicle has got into the earth, the plumule rifes upwards, fometimes bringing along with it the cotylidons, which are, in fome in-frances, converted into the feed-leaves.

During this time, the plant is nourished principally by the cotylidons: for if the root be defroyed, the plumule will rise up, and when it gets above ground, and its leaves spread, fresh roots will be thrown out.

If a plant be cut off below the cotylidons, it will hardly ever push out fresh leaves, but rots and is destroyed; on the other hand, if it be cut above the cotylidons, it generally shoots as fresh, and continues to grow: therefore, if plants whose cotylidons come above ground, as turnips, be cut, or eaten to the ground by any animal, they decay; but if such whose cotylidons remain below ground.

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the graffes for example, are cut; they thoor out

After the plumule is come above ground in the graffes, there is a knot or fwelling formed above the cotylidons, where the stem divides into, or throws off, several branches and fresh roots, and as soon as the leaves of these spread, the first root dies. This is called tillering.

These branches are more or less numerous according to the richness of the foll, the tenacity of it, the room the plant has to grow in, the moisture of the soil, and the earliness of the season.

Each of these branches may be made to divide a second time, by sowing the seed early in the autumn, it, in this case, branches out in the autumn, and again in the spring, by cutting the stems, by cutting the roots, by transplantation, by great moisture in the soil; and hence corn, after it has slowered, will sometimes branch out a second time after heavy rains.

in a poor foil or dry feafon, the branches are apt to run up weak. I tong it and the branches are apt

Most perennial plants, excepting trees and shrubs, become so, by branching out afresh every autumn; the old roots and plants dying.

Roots push forward with confiderable force, which

which however is not equal in all parts; and a confiderable refiftance stops them, and makes them branch out laterally.

If the refistance from the tenacity of the foil be too great, they break out into a vast number of branches, too weak to support the plants; and if too little, they run out into long fibres, having too few ends or mouths to absorb sufficient nourishment.

The root always runs to where there is the least resistance. The stems go on flourishing more or less, according to the moisture of the soil, the heat, the soil's being adapted to the roots, the richness of the soil, its cleanness from noxious substances, and the time the seed has been kept; for the shorter time it has been kept, the more luxuriant the plant.

The stempushes out from itself, the slower-stem; which rises either laterally, as the leaves spread, as in peas; or terminates the stem; and in this case, either there is only one, as in grasses, or several, as in turnips and cabbages.

When the flower-stem rises laterally, the leaves continue to flourish after the flower is dropped off, and of consequence till the feed is persected, and the whole plant dies; but when the flower-stem is terminal, the leaves begin to wither as soon as the flower drops off. Hence, as the nourithment

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after this period, is drawn entirely from the ground, without any exsudation into it of juice imbibed from the air, it follows, that grasses and other plants which have terminal flowers, enrich the soil till they flower; but afterwards impoverish it; perhaps, in some degree, in propotion to the weight of the seed.

In graffes, no new leaves spring out from the stem, after the slowering; and those which have already sprung out begin to lose their juices and decay.

Grass should therefore be cut for hay, as soon as it is fully in flower. Different grasses flower sooner or later; therefore, if two grasses grow in the same field, either one or other must be cut too soon, or too late.

All plants have male and female parts of generation; the chives, or male part; the pointal, or female part. The chives are bags, containing a powder; they open just as the flower opens, and the powder impregnates the female part. This impregnation is sometimes prevented by cold, by very violent rains, by weakness of the whole plant, by weakness of the roots; so that in moist soils, or very rainy seasons, when the plant appears to be flourishing greatly, and a sufficient quantity of flowers are thrown out, the impregnation does not take place, and the seed or fruit either drops off

off entirely, or is small and shrivelled; the roots being rotted by the moisture.

Impregnation is also prevented by the want of air. When the leaves and stem of a plant flourish greatly, it seldom produces many flowers.

In grasses, as the nourishment is drawn from the roots after they flower; if the roots are rotted by moisture, the seeds will not be perfected: in the ripening of the seed, the farinaceous part of the cotylidon is produced.

Plants cannot live without air: it probably anfwers the same purposes to them, as it does to animals. The action of the air appears to be principally on the smooth surface of the leaves, or on the bark of the stem.

The air is rendered effete by the plant, so that there must be a continual supply of fresh air; otherwise the stem runs up to a great length, is exceedingly small and weak, the leaves endeavour to spread out to a great distance, no impregnation takes place in the slowers, the proper juices are not formed, and the whole plant is destroyed. Hence, if several plants are sown in a soil, those which are best adapted to it, will grow up strongest, rob the others of the air, and destroy them.

The roots also require air; so that if a root be too deep planted, it will not grow, and different roots require also different degrees of exposition.

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It is only respirable air that will answer those

purposes.

Light is also necessary for the growth of a plant, but not fo much as air. Most leaves have two furfaces, one of which is always exposed to the light; and if the other is turned to it, (by altering the polition of a branch) the growth is frequently flopped, until the leaves turn themfelves to it again. This fmooth fide of the leaf therefore, being that which is acted upon by the air and light, would appear to be that part by which a plant principally lives; and in many plants the leaves thut themselves up, so as to cover the fmooth fide on exposure to cold air, noxious vapours, darkness, or even upon being touched.

The want of a fufficient quantity of light, prevents the plant from forming its proper juices, (except mucilage and fugar) deprives it of its blue colour, (the green confifting of blue and yellow) leaving it either yellow or colour-less, makes it run up weak, and prevents the impregnation of the feeds. The want of fufficient air and light, particularly affects the impregnation.

Heat, in a moderate degree, according to the disposition of the plant, makes the leaves flourish, and the stem strong, provided the foil be sufficiently moift; in a very great degree, it makes the plant

plant run up too foon to feed, especially in a dry foil, and prevents the growth of the leaves. Heat also prevents moisture from rotting the roots, or any other parts of a plant, but it increases the effects of most other poisons.

The advantages of draining a foil are, the preyenting the water from rotting the feeds, or rotting the roots, especially at the time of flowering; or taking off the effects of the mucilage by too great dilution.

The advantages of fallowing are, the converfion of the vegetable fibres into mucilage, by flopping their vegetation, and exposing them to the air. Also, by destroying weeds, by giving their seeds an opportunity of growing, killing them, and converting them into mucilage; likewise, by decomposing pyrites, and other metallic and alluminous falts.

A very poor foil will be but little benefited by fallowing; inafmuch, as there is nothing contained in it capable of being converted into mucilage, except the rain water. It is therefore better to employ an enriching crop.

Fallowing for several years successively would destroy a foil, as it would convert the whole putrescent substances into mucilage, and that mucilage into salts, and these would be decomposed.

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The advantages of drilling are, the giving an opportunity to destroy the weeds, cutting the fibres of the roots, so as to make them branch out again, loofening the earth about the roots, and throwing fresh earth on the stems, so as to make fresh roots break out; the saving superfluous seeds, and sowing the ground more equally, and giving free passage to the air. From such advantages as these, plants slourish and grow strong, healthy, and vigorous, and are thereby enabled to resist those blasts and rains which would infallibly lodge the weak and seeble plants, that vegetate under less savorable circumstances.

I cannot close this section, without giving a short account of a curious experiment made by Mr. Arbuthnot, upon the growth of wheat, in order to investigate the nature and succession of its roots.

Mr. Arbuthnot had received a hint from Dr. Fordyce, on the different succession of the roots of plants, and found the same clearly laid down in a manuscript said to be written by Dr. Cullen, Professor of Chemistry, at Edinburgh, who explained the nature of the roots of culmiferous plants, in the following words. "Culmiferous plants have three sets of sibres: the first set is formed on the radicle, the second set is formed above this,

Dr. Fordyce's Elements of Agriculture, p. 72, and feq.

at a knot on the plumule; the third, at a knot on the plumule above the fecond: this the discovery of Bennet, upon the due formation of these three knots and sets of fibres, I judge the tillering of frumentaceous plants does entirely depend: that if these knots are impersectly formed, the plant impersectly tillers. These three knots are termed by Bennet, the infancy, the adolescence, and the maturity of the plant. At the two uppermost knots, the tillering is formed."

Mr. Arbuthnot was hence induced to fow a few grains in water, to watch the fuccession of the roots. He cut a hole an inch square in a bungcork, in which he laid some wool, and upon that three grains of white wheat, and floated them on water in a glass tube eighteen inches long. First, there were three fibres fhot from the radicle. which branched into innumerable fibres; upon the wheat spearing, fresh fibres struck out as defcribed by Dr. Cullen. Soon after they were established, the three first fibres with their branches gradually decayed; as foon as it was in ear, the fresh fibres made their appearance, soon after which the fecond decayed, and the last remained in possession of the water. The roots straightened, when taken out of the water, meafured two feet and a half long. The wheat blofformed and ripened in its regular courfe. 131 that and to drawing has not

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He tried the same experiment in another glass. mixed with some wood-ashes: the seed rotted on the furface; owing, as supposed to the quantity of wood-ashes being too great. The motive was to fee if it would lead to any discovery of the cause of smut; for Mr. Arbuthnot apprehended that difease to be owing to a want of proper nourishment in the last succession of roots; the grain then being in a mucilagenous state, there may not be a fufficient quantity of food to carry it through that state. He has observed, that part of a field which has been full of weeds, fmutted when the rest has escaped; and likewise, when strong land has been much poached in fowing, and afterwards baked, whether on the head-land or middle of the fields, such parts have been most subject to fmut; owing, as he believes, to the furface of the earth not being pervious enough to admit the last fet of fibres, which it is to be obferved, first shoot from the plumule into the open air, and then introduce themselves into the furface, frequently at the distance of three quarters of an inch. This fact Mr. Arbuthnot has many times remarked, in examining the roots of fieldin residion of the water. I he roots fraight land.

This curious investigation of the succession of the toots of culmiferous plants, and the formation and growth of the last set of fibres, leads naturally

turally to two conclusions of great importance: First, that it is highly necessary to have the ground well prepared by hoeing, for the reception of these fibres issuing from the last knot; otherwife, the plants are not only deprived of the nourishment required, but also of hold and stability against the attacks of wind and rain, and are thereby eafily lodged. A most intelligent friend of mine, whose veracity I can thoroughly rely on, informed me, that he has feen a whole field of wheat laid down as if mown, and withering on the ground; and that upon examining into the cause, he found the above mentioned fibres had not been able to penetrate the furface of the ground, which, from much wet, and a fudden drought, was to them become hard and impenetrable.

And, secondly, should we not also from hence conclude, that the feeding of wheat with sheep, may be attended with very dangerous consequences? for, if this part of the root, being above ground, is nibbled or wounded by the teeth of these animals, it might prevent them from sending forth a set of vigorous fibres, so necessary to the stability, health, and produce of the plant.

However plaufible this fystem may appear, and however much it may feem supported by experiment; yet there are many intelligent persons, who do not admit of it, in its full extent. The Rev. Mr. Cooke, the ingenious inventor of the drillplough, contends that the third and last set of roots are by no means a certain offspring of culmiserous plants, but merely an adventitious or cafual growth, produced by the great vigour of the plant, and the sertility and moisture of the soil, when laid up to the stem. This, he says, may create this last set of roots, which may lay hold of the earth, and increase the stability of the plant, but are not absolutely necessary to its nourishment.

He very justly observes, that by Mr. Arbuthnot's experiment, the last set of roots do not push out till the wheat is in ear; and yet by Dr. Cullen's hypothesis, they are supposed to be the cause of the tillering of the plant. One or other of these conclusions must be erroneous.

Mr. Dickson, author of the Fasciculus Cryotogamicarum, and a person of much knowledge in
the vegetation of plants, is of opinion, that though
this last set of roots does not contribute in any
respect to the tillering of the plants, yet it must
be of real utility to the plant, otherwise, it would
not be there. He says, Mr. Arbuthnot must be
mistaken, when he supposes that the first set of
roots dies, when the second establishes itself in
the ground; or that the second dies, when the
third establishes itself in the ground. These roots,
says he, become indeed hard and wiry, but do

not die, till the plant is fully ripe, and begins itfelf to decay. Then indeed the roots also decay, but not till then; for they administer nourishment to the plants, till the last.

Dr. Hunter, in his Georgical Essays, (p. 28, of the last edition) has given us a system, differing in fome respects from all of these; which, he tells us, he drew from long and careful observation. Without taking any notice whatever of the last, or uppermost fet of roots, he mentions the former two; the first of which he calls the feminal roots, which he makes proceed immediately from the grain and feed fown. From this feed, he describes a pipe fhooting upwards to the furface, which is by Dr. Cullen, and others, called the plumula. This pipe he mentions as conveying nourishment to a knot or fwelling, very near, but under the furface of the ground, and from which knot he makes the coronal roots to fpring, and to incline downwards, fo as to lay faster hold of the soil. According to the length of the pipe, or plumula, he supposes the plant to be stronger or weaker; but why its additional length should give additional vigour to the plant, he forgets to explain.

Here, then, is abundant variety of opinions, upon a fact not fully afcertained, and which is well worthy of the attention, and accurate experiments, of the curious cultivator.

SECTION

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#### Of the Preservation of Corn. the last edition) has given us a lyfical, different in

N countries where there is much uncertainty. of the weather, as in our own, the corn, when reaped, is commonly laid up, either in stacks or in barns. The manner of making the former, and the advantages attending them, have been already spoken of. Stacks should always be placed on a dry eminence, and be well fenced against When the husbandman has begun to use a stack, he should house the remainder of it as foon as possible; for which reason, it is most eligible to make them fmall and more numerous, and when rightly managed, they will fave confiderable expence in otherwife necessary buildings.

To make the threshing floor, the surface of the place is dug away to the depth of about fix inches, and the earth thus taken off, after being cleared of stones; is mixed with the strongest clay that can

be had, and with dung of cows or oxen.

This mixture is then worked together with water, till it is of the confishence of thick mortar,

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SECTION

and the compost thus made, is spread as smooth as possible, with a trowel, upon the spot from which the earth was taken. As it cracks in drying, it must be beaten down with great force; or rolled with a heavy roller, till all the crevices are filled up; and this must be continued, till it is quite folid, hard, and firm.

This is the common method: but there is a more simple way that will succeed better, which is, by taking good stiff clay, free of stones, and laying it down in the place where the sloor is to be made, in the same form, and on the same bed in which it formerly lay; then beat it down and roll as above, without adding any new mixture to it, and it will thus beat into a more solid and compact body, than by giving it any additional ingredient. Two, or even three layers, of three or sour inches thick, may be necessary, to make it very close and firm.

The best barn, both for threshing and keeping of corn, is, undoubtedly, that which is driest, smoothest, most completely solid, and, consequently, freest from cracks and holes, in which vermin or infects might shelter themselves and breed.

The ancients were very careful in this respect; and used lees of oil in forming their stoors, to prevent the growth of weeds, and also to preserve

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the corn from being devoured by mice and rats.

Their barns were always placed high, and as dry as possible.

I am however perfectly convinced, that there are no floors ultimately fo good or fo cheap, as those formed of found, thick, and well seasoned oak-plank, which both answer well for threshing, and for preferving the grain from all moisture: and when close jointed, planed, and tongued, will lodge no infects, and allow no feeds to escape. These flooring boards should be laid on joists raised a little from the ground, and the space underneath should have a layer of chalk, well rammed or beaten down, to prevent the damp air from rifing and rotting the joifts. If no chalk is near, a free circulation of air must be admitted. Barns are commonly built of fuch materials as are most readily found in that part of the country where they are erected.

It may however be proper to remark some sew circumstances respecting their construction: viz. that their roofs be well covered, so that no wet may penetrate to the inside, which would hurt the corn. Frequent apertures should be lest in the side-walls to admit a thorough drast of air, without letting in rain or snow. This is not difficult to be contrived; for as there are sheds for various purposes generally leaned to the walls of

barns

barns, the appertures may be made under the roofs of these sheds. Two large solding doors should face each other, on the opposite sides, for the convenience of carrying in and out a waggon load of corn in sheaves; and these doors should be of the same breadth as the threshing sloor, to afford the more light and air, for threshing and for winnowing.

It is most adviseable, and indeed most commonly practised, in countries which abound in corn, to have a separate barn for wheat, another for spring corn, such as barley and oats, and a third for peas, tares, clover, sainsoin, &c.

Some art, which must be the result of practice, is required in the placing and piling up of the sheaves, both in stacks and in barns. The former has been spoken of; and in regard to the latter, the sheaves should, as much as possible, be pressed so close to the walls of the barn, as not to afford the least room for rats or other vermin to get in between them; for if they once get admittance, they will soon penetrate farther, lodge themselves in the mow, and do vast prejudice to the corn. Where this missfortune happens, the only remedy is to take down the mow, kill the vermin, and pile it up anew.

This is however a laborious talk, and there fore I would advise the husbandman to have his

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barn at least, well cleared of vermin before the corn is lodged there, and it should be lined with very thin iron plates, to prevent them from getting into it.

Grain which is preserved some months in the straw, and is heated in the mow, certainly sweats out its mosture, and gets harder and fitter for keeping: but people of skill are not agreed, whether grain is most proper for seed when quite new, or after being kept till the following year.

There should always be a space referved in the barn, or in some out-house adjoining, for laying up the straw of all kinds; as nothing is more useful about a farm yard; not only for the food of cattle and hories in the winter, but also for cutting into chaff to mix with horse-corn, also for litter to all the animals, both in the house and in the vard : all of which is productive of a large quantity of excellent manure, when trodden down and mixed with the dung and stale of cattle. In another building adjoining to the barn, or in a lean-to, should be contrived a floor of thin firestone, tiles, or plates of cast-iron; which might be of any convenient fize, not less than ten by fifteen feet. Under this floor should be formed a flue, with partitions of brick-work, of one half brick in thickness, and this flue should meander backward and forward under the whole extent of

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the floor, from a fire place and furnace door at the one end, to a perpendicular flue at the other, rifing to a convenient height above the roof, like a chimney top. A fire lit with any fuel, in the furnace, will draw through all the meanders or windings of the flue, and rife through the chimney top, into the air, by which means the floor will foon be heated; and upon this floor the new threshed grain should be thrown in considerable quantities, and turned with a shovel till no moifture or steam arises from it, and that it feels perfectly dry, smooth, and slippery.

This operation, which may be performed at a very small expence, will be particularly useful to grain which has been housed somewhat damp; from a rainy season, or any other circumstance: but even in the driest years, it will improve the look and the seel of the wheat, so much, as to make it more marketable and bring a better price; nor will it injure it for any one purpose whatever, but on the contrary, will improve it intrinsically.

It is well known that gardeners put their choicest seeds, such as those of melons, &c. on the tops of their hot-house flues, in order to dry and preserve them for sowing. This sloor, heated sufficiently, might also answer the purpose of preserving wheat from that destructive infect, the weevil, instead of the oven recommended by M.

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du Hamel, and could be used with much less trouble and expence. Such a floor might answer also for malting, and for preparing potatoes, and other roots, for the food of cattle, of which I have formerly spoken. Nay, perhaps it might even answer for drying of hops, hemp, and flax, as I shall notice hereafter.

Though the flail be the best instrument yet known for threshing of corn, because it separates the grain from the straw and husks very expeditiously; yet, as it always bruises a great many seeds, even so as to render them incapable of vegetating, it were much to be wished that some method could be found, by which this essential inconvenience might be avoided.

An engine for this purpose has been invented by Mr. Winlaw, who has given an account of it in the third volume of the Bath Society's Tranfactions, together with an explanatory plate.

As a successful invention of this kind is, in my opinion, a very important desideratum in husbandry, it is to be regretted, that we have not yet had some satisfactory experiments made upon this machine; not with a handful, or even bushels, but to a considerable extent. If such experiments had been made, and savorable reports given, I should with great pleasure have repeated them

them here; from a defire of promoting so useful a discovery.

I have also been informed of a water-mill erected at Aloa, in Scotland, for threshing of barley, and have been told that it succeeded; but my information is not sufficiently authentic, or accurate, to warrant any favorable report of it here.

While flails are our only resource, it is the more necessary to observe, that the thresher ought not to wear thick iron-clouted shoes, whilst he is at work, especially in threshing new corn, and more particularly in threshing wheat; because they will be apt to bruise it. His shoes, for this purpose, should be soaled with an old hat, or some other soft substance.

Mr. Mortimer esteems it a day's labour for a man to thresh four bushels of wheat or rye, six bushels of barley, sive bushels of oats, or sive bushels of beans or pease, if the corn thresh well.

But Mr. Liste says, a good thresher assured him, that twelve bushels of oats or barley are reckoned a good day's threshing; and that this very man had threshed sourteen bushels of oats daily, and winnowed them, for several days together; but that those oats yielded remarkably well: that five or six bushels of wheat are a very good day's threshing, and if the corn be clung and yields ill,

fometimes three bushels are as much as can be threshed in a day. He rates the common price of threshing at eighteen pence for a quarter of corn, and observes, that fix bushels of wheat, of the growth of a warm gravelly vale, are as eafily threshed in a day, as four bushels of the produce of cold hilly land; because the stroke of the stail must be forced down stronger to beat out the grain of this last, than it need to be for the former: this may account for the difference between his estimate and Mr. Mortimer's.

As the straw of corn which is the growth of a light foil, is shorter than that of a strong clayey ground, more sheaves, and consequently more ears, of this first fort, may be laid together on a floor of equal extent, than can be of the laft. whose longer straw requires proportionably more room. The state of the state of the state of the

The prices of threshing and cleaning a load of wheat of five bushels,\* is here twenty pence, the fame for threshing and cleaning a quarter of barley, and for threshing and cleaning a quarter of oats, fixteen pence; but if fmall beer is allowed, two-pence on each of the above articles are then deducted the letter for the test to mean a

But when this work is done by the great, it is

often

A bushel of St. Alban's measure, is four pecks and three pints, Winchefter. minima;

often performed in fo flovenly a manner, and fo much grain is left in the ear, that the farmer must either be very attentive, or fuffer much loss. This circumstance alone, would make the invention of a good threshing machine not only valuable to the individual, but to the public at large,

The worfe wheat is, though it be never fo dry, the rougher it will feel when handled; because thin and coarfe wheat is not fo plump and globular as fine wheat, but is apt to be pitted and wrinkled, which of course renders it less slippery It will handle cooler out of a flack two years old, than it will out of one that is only a year old: for in that time the mists and rimes, especially in a hilly country, will be driven into the flack.

Mr. Lifle, who makes this remark, adds, from his own experience, that wheat threshed in damp weather, generally yields little flour, with much bran, when it is ground; and that if put into facks, it will grow musty in less than three weeks, let the weather be ever fo dry afterwards: but if it be threshed when the air is perfectly clear and dry, it will keep well in facks for a long time; especially if these are laid on a very dry floor.

For the keeping of meal, in general, there is no better way, than first to bolt it, and clear it from the bran, which is very apt to corrode and putrify it, and make it musty; then to tread it - brancutons

down as hard as possible, and head it up closely, in clean, dry, tight, and well bound casks; which must be laid in a cool, dry place.

The beards of barley come off best in threshing, when the swarths of this corn have taken the dew before their being housed. It will keep well in the mow, unthreshed, for one year; and for making it into malt, which must be done before the heat of the summer comes on, it must not be kept above a year and half, or at most two years, otherwise it will be filled with weevils, unless it has been previously cured in a stove or kiln, such as I have before described.

Oats, being defended with a double husk, are the grain least subject to harbour vermin. The best way to keep them after being threshed is, to dry them well on a kiln, and then to barrel them up in clean close casks: but they should not be threshed earlier than Christmas, because they are not fit for keeping before that time.

Beans and peas always thresh best after they have sweated in the mow, which they are very apt to do; because, as the whole crop of either of them never ripens all together, the green parts heat, and communicate their ferment to the whole heap. The danger to be guarded against here is, that the green so heated, do not give fire to the ripe, by which both might be either rotted or consumed;

confumed: to which, the bigness of their leaves. and hardness of their stalks, which continue moist and fappy a long time, will also contribute very much. For this reason, farmers generally choose to flack them without doors, rather than to house them, that they may be more thoroughly dried by the fun and air. As beans are a very large feed, and confequently full of moisture, it is found best to let those that are intended for keeping, fweat in the mow till March, when they may be threshed without danger; for beans never give again, after they have been once thoroughly dried. But if they should be found foft and damp even at that season, the best way is to kiln-dry them; after which they will keep many years without turning or any other care, though they be laid ever fo thick in the granary.

Peas are of all grain the most subject to rotteness and impersection, because they are the most apt to breed worms, weevils, and mites, by reason of the susciousness and sweetness of their grain. The better they are dried, either in the kiln on sun, the former of which will generally be found most effectual in this country, the longer they will keep sound, and the fitter they will be for the food of cattle, by making them drink; and if eattle drink, they feed and fatten well. What is intended for the use of man, need not be dried

them

too much, but may be preserved by putting them into close casks, and heading them up. In granaries, they keep best in thick heaps, or in bins; spreading them thin upon the floor being apt to dry them too soon, and to take from them much of their sweetness and goodness.

Vetches wanted for feed, immediately after they are cut, may be threshed upon a cloth, if too fost to be threshed on a sloor, where the shail and thresher's feet would be apt to bruise and break them.

When a careful husbandman opens and spreads his sheaves, he will pick out of them at least all the largest and most apparent weeds, before he begins to thresh. As he proceeds in his work, he will, from time to time, remove with a fork, all the long straw from the corn beaten out of it; which last lies always underneath; and then remove the pieces of straw, broken ears, &c. with a wooden rake. He will then shovel the remaining grain up on one side of the stoor, and repeat this till he has threshed out enough, to make what is commonly called a clearing.

This heap is then passed through a wide sieve, which retains only the bits of straw, and such fragments and ends of the ears as have escaped the slail. These frequently contain very good corn; though the sarmer seldom grudges giving them

them to his poultry, or binding them up with straw intended for fodder. A few of them inclosed in a small truss bound at both ends, the better to keep them in, will entice horses to eat heartily of this straw, which affords them good nourishment. They might also be good winter's food for sheep.

A great deal of labour may be faved in the using of a sieve, by fastening a loop to its rim, and resting it thereby on a hook suspended by a rope. This will sustain the weight, and the winnower may easily give it the circular motion. But a yet more convenient method is, to place a square sieve of wire, with thin boards for its sides, upon two polished rods of iron, to throw the corn up into it with a shovel, and to push it backward and forward on these rods, on which it will move glibly, and sist much corn in a short time.

For separating the chaff, which is the next bufiness, the casting-shovel is thought to be much more expeditious, than either the wicker-san, or the common winnow with sails. When this shovel is used, the wind should blow through the barn. The winnower then placing himself under the wind, and close to the heap of corn that is to be cleansed, takes it up, one shovel-sull after another, and, with a circular motion, throws it scattered

fcattered in the air, against the wind, towards the opposite side of the barn. The best grains, which are the heaviest, go farthest; the leffer fall fhort of them; and the very small, shrivelled and much damaged, with the feeds of cockle. darnel, and feveral other weeds, fall still nearer to the man who throws them; while the lighter feeds of other weeds, with the bits of fraw, chaff, dust, &c. are blown from all the rest by the wind. From time to time, the winnower quits his shovel, and sweeps away the second fized corn, which would be too much intermixed with the smallest, if the heap was lest alone and suffered to accumulate till the end of the winnow. ing; and when the whole is done, he shovels up the finest grain. The smallest of all, which borders on the chaff, &c. is also then collected, and the three forts, after being fifted, or screened to cleanse them from any remaining dust, are laid up separately; the first for sale, the next for domeftic uses, and the third, if the farmer can aft ford it, chiefly for the food of poultry. The fhort straws and chaff are fifted in a pretty fine fieve, to clear them likewife of dust; and are frequently given to sheep, cows, or oxen.

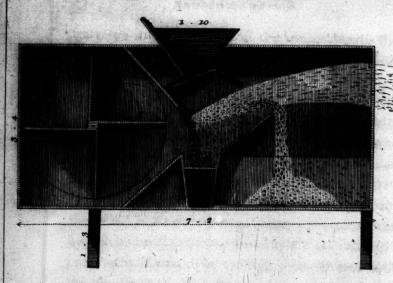
Mr. Lifle observes, that the seeds of weeds cannot be feparated from any grain by the common fan, but that it may be done with the fcreen ? Estatation!

Linter Section of a Winnersony Machine Sant and the sections.

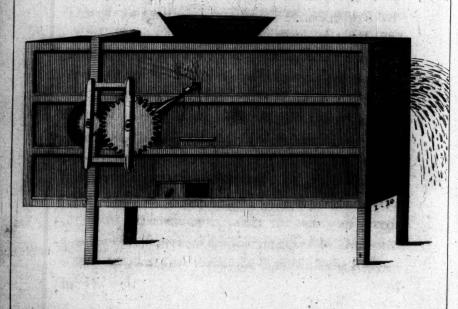
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Section of a Winnowing Machine .

Plate I.



Profile View of the same .



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of which he therefore advises the constant use for all forts of corn designed for sowing.

Though wind is, in all cases, the chief agent in the cleansing of seeds, which being intrinsically heavier according to their goodness, are carried to different distances in proportion to their weight, and thereby separated as I have thus described; yet the natural action of this affishant is liable to many inconveniences: it blows not constantly, but frequently disappoints the farmer in his time of greatest need; and when it does blow, it is not always in the best direction to answer the situation of his barn. Besides, even when its force can be applied in the best way, it is not always then equal; but generally acts by sudden blasts, which disorders the work, and occasions a waste of seed.

These inconveniencies are now frequently avoided, by using a winnowing machine which creates an artificial wind, uniform and steady in its action, and always ready at command.

As these machines are little used in this part of the country, I had one of a very simple condition, and moderate price, sent use from Scotland, and here give a plate and description of it.

Though, happily for this kingdom, we are not, like some other countries, under the necessity

of

of erecting large edifices for public granaries, because our harvests are much less apt to fail us; yet as on some occasions granaries may be useful both to the individual and to the public, I will briefly mention those qualities which render them most commodious and most perfect.

There are three general rules to prevent the corruption of corn.

First, to take care that it be thoroughly dry, and as clean as possible.

Secondly, to make few openings, and those to-

Thirdly, to prevent, by means of thin canvas fleeped in oil, the too free access of external air, which brings along with it infects, or the eggs of infects, which prey upon and destroy the grain.

Granaries should be strongly built, and strongly sloored, for they carry great weight. Scantlings of oak or fir should be inserted into the
walls, to which a strong deal or thin iron plate
lining should be fixed, close to the walls, to prevent vernin lodging there, and also to prevent
the grain from imbibing any damp from the exterior walls. Good strong deal or oak slooring
boards are also freest of moisture; they should be
plowed and tongued, to prevent the corn from
falling through the joints when they shrink,
which

which they will do less or more, though well seasoned.

There may be several low stories over one another; for the shallower corn lies, the better it will keep, and the more easily it is turned. Some have a small hole in the floor of the upper story, through which the corn descends into the lower one, like the sand of an hour glass; and after it is all come down into the lowest granary, it is hoisted again into the upper one; so that it is kept in continual motion, which is a great means of preserving corn. But the usual way of preserving it in our common granaries is, after it has been sisted and screened, to spread it upon the floor, about six inches thick, to turn it twice a week, and to repeat the screening once a week, during the first two months.

It is then laid a foot thick, for two months more; and in this time it is turned once a week, and now and then it is screened again. At the end of some months, it is raised to the thickness of two seet, turned once a fortnight, and screened as occasion requires; and thus the thickness may be gradually increased, and the turning and screening diminished, the longer it is kept: at the same time, the more frequently this is done, the better the grain will be preserved.

Those who are desirous of being more fully in-

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formed on the subject, will find it amply discussed by M. du Hamel, in his treatise on the preservation of grain.

In that treatife, M. du Hamel gives an account of his fucceffive experiments in preferving grain from its two great foes, the false-moth or cornworm, and the weevil, by the means of kilndrying and ventilating.

I shall here add a short account, extracted from the Bath Society's Transactions, of a very simple method of getting rid of the last-mentioned insect; which, if effectual, has the advantage of being both easy and unexpensive.

M. de Brosses, first president of the parliament of Dijon in France, sinding that the weevils had got among some wheat, at one of his farms, tried almost every method to get rid of them, but in vain; for his granaries still continued insested with this voracious insect. At length, being informed of a way to destroy them, which had been practised with success in the province of Poictou, he set about it in the following manner.

He got some live lobsters, which he threw on the wheat that was infested, and in sour hours time the weevils came out from all parts, dispersing themselves over the walls in such numbers, that in many places they were quite black with them, and were thus easily destroyed.

The

The smell of lobsters, particularly if left till they stink, always proves fatal to these insects; and yet will not in the least affect the corn. This remedy should be used as soon as the weevils appear, or begin to make their nests\*.

Mr. Wagstaffe has also favoured us with a very easy method of extirpating these insects; by which, he says, he effectually cleared two of his own barns. This is, by turning a hen or two, with newly hatched chickens, upon the heap, which they will traverse without seeding, or very sparingly so, and are seemingly insatiable in the pursuit of these insects. When the numbers are reduced within reach, a hen will sly up against the walls, and brush them down with her wings, while her chickens seize them with the greatest avidity. This being repeated as often as they want food, the whole species will in a day or two be destroyed. Of the phalæna (moth) and the small buttersly they seem equally voracious.

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Bath Soc. Trans. Vol. II. p. 116.

### ESSAY IX.

A new an long of blood to

Of the Culture of various ufeful Plants.

# SECTION L

## Of HOPS.

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THE best method yet laid down for the culture of Hops, is delivered nearly to the following effect, in a pamphlet drawn up, and published, by order of the Dublin Society for the advancement of agriculture and manufactures.

A rich, deep, mellow, dry foil, more incling to fand than clay, is, in general, the fittest for hops; and in particular a black garden mould is excellent. Stiff clays, spewy lands, such as are apt to be overflown by floods, hard gravels, strong grounds, very sandy ones, and such as are not at least a foot and an half deep, are altogether improper for this plant.

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The best situation for hop-grounds, is such as inclines to the south-east, or lies open to it, so that they may have the benefit of the morning sun, to dissipate the moist stagnant air, inimical to all plants; and also to carry off the morning dews, which lying too long on the plants, may chill the young shoots or leaves; and particularly to prevent the bad effects of a sweet dew or juice, extracted from the plants, or lest on them in sultry hot weather; which dew, if it remains on the plants, is apt to breed infects, as is frequently the case in the blossoms of apples and other fruits, which bloom late.

Hop-grounds should also be open for the air to have a free passage and circulation between the plants; and it should be so sheltered to the north-east, north, north-west, and west, that neither the frosty winds in the spring may cut off the young sprouts, nor the more stormy ones in summer and autumn destroy the full-grown hops.

The ground and situation being chosen, the next business is to prepare it for the planting. Sufficient directions have been already given for bringing land into the most perfect tilth, by deep plowings, cross plowings, and harrowings; and when thus prepared, it may be sown with turnipaseeds in the end of July, or beginning of August; and if the turnips are twice hoed, the weeds will be Vol. II.

destroyed, and the ground rendered looser and finer. Another good plowing after the turnips are taken off, will, with the ensuing winter mellowing, render it fit for being planted with hops in the spring.

If the mould of the hop-ground be naturally good, and brought into fine tilth, there will be little or no occasion to manure it the first year; but if the soil is not rich or fine enough, it would be right to give it some fresh mould in the spring; if mixed with old rotten dung, or marle, or lime, or soaper's ashes, it will be the better.

At fifteen or twenty feet distance from the hedge, and parallel to it, set out your hills at the distance you propose, and drive in a stake to mark the center of each hill, which may be either in squares chequer-wise, or in the quincunx form; but the former is best, for the reasons I shall mention presently.

The distance of the hills should generally be regulated by the goodness of the soil, but they should always be sufficiently distant to admit the horse-hoe without danger to the plants: and by setting the plants in squares, there is an opportunity to cross plough in the manner before described in the culture of Indian corn, potatoes, &c. This is particularly adapted to the culture of the hops, where the distance between the

plants afford ample space, and the cross plowing forms and augments the hills.

If the foil be dry and shallow, fix or seven seet will be a convenient distance: but if it be rich, moist, and apt to bear large hops and leaves, it may be right to allow eight or nine seet between the hills. If the hills should be found to be too far asunder, after the ground has been planted some time, and is thereby become what is commonly called an old hop-ground, that inconvenience may be somewhat remedied, by enlarging the hills, and increasing the number of roots and poles: and if the hills are too near, it will be necessary to lessen the number both of plants and poles: for the over-poling of a hop-ground, either in number or height of poles, is of much worse consequence, than poling it too little.

The most proper season for planting hops, is from the beginning of March to the middle of April, at the time when they begin to shoot.

There are several sorts, though the botanists allow but of one species of hops. The most esteemed are the long white, the oval, and the long square garlic hop. These differ from each other in the colour and shape of their bells, or hops, in their degree of bearing, and in their time of ripening. The long white is most valued, because it is a great bearer, and produces

the most beautiful hops: for the beauty of hops consists in their being of a pale bright green colour. The oval hop is beautiful, but does not bring so large a crop. There is a fort of white hop, called the early or rath-hop, which ripens a week or ten days before the common, and is therefore of advantage to those who would be first at market: but it is more tender, and does not bear so plentifully. The long square garlic hop is the greatest bearer, more hardy, and somewhat later ripe than the former; but, by reason of its redness towards the stalk, it is not so beautiful to the eye, and therefore is not so much esteemed as the other forts.

Few hop-grounds are without some plants of a fort of hop, which many, very improperly, call the semale hop. Towards the middle of July, it puts out a great number of long loose branches of small slowers, not at all like the true hop. The common practice is, to mark them at their first appearance, and to root them out afterwards, because they do not bear bells or hops; and as they are generally the strongest plants, sets might otherwise be taken from them, by mistake.

There is also a poor starved hop, called a wild hop, which is not judged to be a different fort, but a hop which has degenerated for want of culture.

The several kinds, and goodness of hops, may also be known by the colour of the vines, binds, or stalks. The whitish binds produce the white hops, both the long and the oval; the grey or greenish binds commonly yield the large square hops; and the red binds bear the brown hop, which is the least esteemed.

The hop-planter ought to be extremely careful in the choice of his plants, or fets, particularly in regard to the kind of hop: for it is a great trouble and loss to him when his garden proves to be a mixture of several forts, ripening at different times. He who plants the three forts before mentioned, in three different parts of his ground, will have the trouble of picking them successively, as they become ripe.

Hop-fets are cuttings from the roots or branches which grow from the main root or stock. They should be procured, if possible, from grounds planted with none but the fort which is desired; and they should be from five to seven or eight inches long, with three or more joints or buds on them; all the old bind, and hollow part of the set being cut off.

If it be defired to increase any particular fort of hop, by taking plants or sets from it, the supersuous binds may be laid down when the hops are tied, cutting off their tops, and burying the lower end in the hill: or when the hops are dreffed, all the cuttings may be faved, and laid in tows in a bed of good earth: for almost every part of them will grow, and become a good fet the next spring.

Some have tried to raise hops by sowing the hop-seed; but this turns to no account.

The largest sets should be preferred: the best are to be had out of gardens which have been well kept: they should be of the growth of the preceding year; which is easily known by their colour, always white when they are of that age.

The ground being prepared as before directed, towards the latter end of February or beginning of March, if the foil be light, or late in March if it be ftrong and molft, make in the places marked with the stakes, holes about twelve or fixteen inches wide, and of a depth proportioned to the nature of the foil. In general, ten or twelve inches will be fufficient. If the ground be shallow, and you meet with hard clay or gravel, by no means enter into this, for you would then make a bason to retain water but in such case. raise up a small hill of good mould. If there be a good depth of rich mellow mould, dig the hole a foot and a half or two feet deep, and you will find the hops thrive the better, for their tap-roots naturally run downward their file gutting that sie

distance, bring no more of them at a time than you have holes made ready for them, and plant them as soon as possible; taking care, by keeping the roots in wet litter, to prevent their growing dry: but if the sets are procured from a great distance, lay them up in dry sand or earth, as soon as they are cut, or pack them in such manner that no air may get to them before they are planted; and when you have brought them home, bury them in ground, and plant them as soon as the weather will permit.

When all is ready for planting, fill up the holes with the mould thrown out of them, if it be naturally good, after having first broke it fine with a spade: but if the same earth be not rich enough, make use of fine fresh mould, or of the compost provided for this purpose. About a peck or two will be sufficient for each hill, as was observed before; but no new dung should be put into the hole, on any account.

Then, with a dibble, make five or fix holes the depth of your fets, one in the middle perpendicular, and the rest round about, sloping, and meeting at the top, near the center: put your sets therein, so that they may stand even with the surface of the ground; and then press the mould close to them, and cover them with fine mould

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two or three inches thick. A stick should be placed on each side of the hill, to secure it. Some place all the sets in the middle of the hole, before they fill it, spreading the lower parts of them towards the sides, and laying the tops even with the surface; then, holding them tight with one hand, they throw the mould in with the other, and press it round about them. Either of these ways may do; but the first is most convenient, and most in use.

Care must be taken to plant uppermost the end of the set which grew so before, and not to leave any part of the dead stalk on the upper joint. The right end of the set may be discerned at once, by noticing the direction of its buds or eyes.

If the fets have begun to shoot before they are planted, the young buds should by no means be covered with mould; for that would destroy them.

The ground being thus planted, all that is to be done in the following furamer is, to keep the hills and alleys clear from weeds, by frequent hocings; to dig the ground in the month of May, and carry off all the stones that are turned up by digging; to raise a small hill about the plants, to throw some fine mould on their roots, and in the latter end of May, or beginning of June, to twist all the vines and branches together into a bunch,

or loofe knot, and lay them thus twifted on the top of the hill. Some choose to put to each hill one or two sticks, three or four feet long, for the vines to twist about; as more agreeable to the hop, especially if the vines be vigorous: but care must be taken to prevent the hop from bearing the first year: for that would weaken the plant.

At or about the next Michaelmas, if the wear ther be dry, and the ground hard enough to bear the wheels of a dung cart, otherwise wait till the frost has hardened it, lay on the alleys between the hills, of rotten dung, or dung mixed with mould, or other manure, which every hop-planter is supposed to provide for his winter-dreffing. about forty loads, of thirty bushels each, to an acre; more or less, according to the goodness of the land; and in November or December following, dig or plow it in, that it may the better incorporate with the foil. Some, especially when they cannot manure their hop grounds till the fpring, though it is much better to do it in autumn, give their young hops a small dressing in October next after they are planted; and in fo doing, they open the hill carefully, in dry weather, and cut the binds a little below the furface of the earth, then cover the tops of the plants with fine mould two or three inches thick, and lay thereon a thin coat of earth from the alleys. This

This defends them from the frosts in winter, and is of use at the next dressing in the spring; but in the mean while, the hop-ground should always be dug or plowed some time in the winter: nor should this dressing in October be practised in any but the first year after planting.

Towards the latter end of February or beginning of March, in the second year, when the weather is kindly, open the hills, and with a sharp knife, cut off the shoots of the first year, to within an inch of the old stock, together with all the young suckers that have sprung from the sets, and cover the stock with sine earth. To keep the knife sharp, have a whetstone always at hand, when dressing.

In the third and following years, when the hop-ground is dug in February, let the earth be taken away with a spade or hoe around the hill, and very near, that the stock may more conveniently be come at, to cut it. Then, in fair weather, towards the beginning of March, if the hops he weak, begin to dress them; but, if strong and healthy, the middle or latter end of March is the best time; for late dressing restrains their too early springing, which is the cause of many injuries to the hop.

The manner of performing the dreffing is thus. Having, with an iron picker, cleared away all the

the earth out of the hills, fo as to lay the stock bare to the principal roots, with a sharp knife cut away all the shoots which grew up with binds last year, and also all the young fuckers, so that none be left to run in the alleys, and weaken the hill: cut them as close as possible to the old root, if the plant be strong: to a weak hop, some part of the new shoot may be left at dressing. The tap roots, that run downward, should not be cut by any means, but only the fide roots, which would otherwise incumber the ground. Great care must be taken not to hurt the old roots; but all the new ones should be cut away, and such as are intended for new fets, should be laid by for planting out. The old roots are red, and the young white; fo that they are eafily diftinguished. If there happens to be wild hops in any of the hills, they must be taken up and destroyed. Some are of opinion that, in this case, the whole hill should be grubbed up, and the spot new planted.

When the hop has been long planted, it is advised to cut one part of the flock lower than the other, and the following year to cut that part low, which was before left the highest. This will make the plants shoot with the greater vilgour.

When the roots are thus pruned, apply fome rich mould or manure, to them; but without making

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making the hills too high at first, lest it hinder the growth of the young shoots.

Though the hops are springing out of the hill before they are begun to be dressed, there is no danger from cutting off their roots.

No poultry, and particularly geefe, should be fuffered to run in a hop-garden in the spring, because they are apt to devour the young sprouts.

If the hops are grown old, or worn out of heart, as it is termed, they will be recovered, and at the same time the weeds will be destroyed, by digging or plowing round them in the beginning of winter, or at farthest in January or February, and laying rich fresh mould to their roots, in lieu of the former exhausted earth, which should then be taken away, as deep as can be done with safety to the plants.

After the hops are dressed the second year, the next business is to pole them. Poles of only ten or twelve feet high will then do; but in the third year, by which time they come to their full bearing state, they will require poles of full size. This, if the ground be rich, and the hop vigorous, will be from sixteen to twenty seet, or even more; or there would be danger of losing great part of the crop.

. If the hop be weak and the ground not rich, the poles should not be more than from fourteen to eighteen feet long, for fear of impoverishing the root; for the hop will foon run itself out of heart, if over-poled; fo that, as was before obferved, there is more danger in over-poling, than in under-poling: neither can a good crop be expected from an over-poled ground, because the branches which bear the hops, grow very little, till the buds have over-reached the poles, which they cannot do when the pole is too long. Two small poles are sufficient for a hill in a young ground.

Three poles to a hill is the number generally used. If the hills are large, and distant from one another, some put sour poles to them; but if they are small and near, two poles may do. In dry hungry ground, the poles may stand nearer together, than in a rich mellow soil; because, this last will produce the largest, and most haulmy plants.

Before the poling is begun, the poles should be dispersed over the ground, three to a hill; observing to put the largest poles to those hills where the hops appear to be most vigorous; but do not begin to pole till the young shoots are ten or twelve inches above ground, which will be about the middle of April, or sourteen days after dressing, in rich land. It will then be dissernible, where the biggest poles are required; and you may continue poling till the hops are two feet or more in height: but it must not be too long delayed, lest the hops be prejudiced, by not having a pole or somewhat else to climb upon; and if the binds are suffered to grow so long as to fall into the alleys, they will be apt to entangle with one another, and not so readily take the pole afterwards.

The better to fix the poles in the hills, make holes in the ground with a fquare iron crow, ending in a sharp point; or with a long wooden dibble, shod in like manner at the point with iron. This instrument should be about three feet long, and not altogether so thick as the poles, in order that they may take the better hold. Its top should be like that of a spade furnished either with an eye-handle, or a crutch, that the workmen may the better force it into the ground.

The depth at which the poles should be fixed in the earth varies, according to the height of the pole, the stiffness of the ground, and the exposure of the plantations to the winds. High poles, loose soil, and a great exposure, require their being put at the greatest depth; but this general rule should be observed every where, that the pole be fastened so deep and so well, that

it shall rather break than rise. The usual depth is about a soot and an half.

Make the holes at about a foot from the centre of the hill, or three inches from the main root, taking great care not to hurt the root of the plant, or any of its young shoots. Make three holes in each hill, one to the east, another to the north, and a third on the west side of it, that all the hops may better receive the south sun. When the holes are made, force the poles into thems driving them down with a quick motion, and place them as perpendicular as possible, or rather bending a little outward from the hill, to prevent the entangling of the vines. A leaning pole commonly bears most hops; but it is more apt to be blown down, than an upright one.

When the poles are erected, ram the earth down on each fide of them with a rammer, to fecure them against the wind; but do not use the rammer within side of the poles, for fear of bruising the shoots of the hops. The rammer may be made of a piece of wood, about four feet long, and three inches thick at the bottom.

Have always some spare poles in reserve, to support the vines, in case any of them should break or be overburthened; for if the hops are suffered to lie on the ground, they will soon perish.

If, after some time of growing, a hop is sound to be under-poled, place a taller pole near it, and bring the hop from the one pole to the other.

It is advisable to place the largest and strongest poles in the third or fourth outermost rows of the plantation, especially on the west and south west sides; for they will stand best against stormy winds, and protect the inside of the hop ground.

In dreffing and forming the poles, cut about a foot or more of the but end, with three fides floping to a point; for this triangular cutting is best to prevent their shaking in the ground. Poles of alder, birch, poplar, abele, or sallow, are easiest and soonest raised, and do well in low hop grounds; but they are brittle, apt to break, tot soon, and do not, at most, last above four years.

The bark of alder and birch is thought to help the climbing of the hop; but being apt to crack, it foon receives and imbibes the wet, which rots the pole; for which reason, some who use them are at the trouble to strip off the bark.

The poles most generally approved, and made use of in England, are those of ash, which are tough and strong, and last six or seven years.

Willow

Willow poles are also in esteem; but those of chesnut are the most durable.

When the poles are set as above directed, and the vines are grown up two or three feet high, such of them as have not taken the poles of themselves, should be guided to such poles as are nearest, and have sewest hops.

The strongest vines should always be allotted to the tallest poles. Two strong, or three weak binds, are sufficient for a pole. They should be bound about the pole, at equal distances, according to the course of the sun, which they constantly follow; and the binding should be of dry rushes or woollen yarn; but not so close as to hinden their climbing up the pole. In doing this, very great care flould be taken not to break, the young shoots, which are more tender and brittle in the morning than in the heat of the day. Women are generally employed in this business. When the selected strongest plants of hops have begun to take to and twine round the poles, all the other weak vines should be cut off close to the hillern't and to amol words and

The hops should be tended constantly during the months of April and May, to guide them to their poles. If the vines are not able to support and keep themselves to the poles, give them as second tying, as high as can be reached; and if they

they for sake the pole after they are grown beyond reach, a forked stick, or a ladder and back-stay, will be useful to tye them up again. If the vines are strong, and much over-grow the pole, some advise to strike off their heads with a long switch, in order to increase their branching below.

About Midfummer, or a little after, hops cease to run up in height, and begin to branch. To fuch as do not, it will be right to strike off the top with a switch, or to divert it from the pole, that it may branch the better; wherever the top or leading shoot of a vine is broken off, it will run no further in length, but will put out branches from the next eye or knot; and there, if carefully managed, will take to the pole, and yield a much better crop than the hop would do if suffered to spend itself by running into length of growth.

Having deeffed, poled, and tyed the hops, as before directed, give the ground a good fummer digging or plowing, some time in May, especially after rain, or at least turn up its surface, pretty deep, with a spade, or breast-plough, or horse-hoe; throw some of the sine earth on the hills, and enlarge their breadth, cutting away, and burying all such superfluous roots or hops, and weeds, as appear on the hills or alleys. This will prevent the hops from being impoverished by weeds, and will also keep the hills moist. The

hills must not by any means be made up and finished all at once, but by degrees, and at different times. Two or three hoeings, at leaft, are requifite in the course of the summer, and at each of them a little fine earth should be laid on the hills, especially after rain, the better to nonrish the roots of the plants, and to keep the hills loofe, open, and moift. Though it be a general rule, whenever you weed the hills, or hoe the alleys, to cast some fine mould on the hill; yet this admits of an exception: for when the vines are very vigorous and full of fap, forbear to give them any more earth; because, excess of nourishment will make them run too much to stalk, and thereby prevent their branching out, and confequently their bearing so many branches of The fap may be increased by enriching the hills, but the redundancy thereof cannot be withdrawn at pleasure.

The fewer weeds there are on the ground, the more hops there will be on the poles: therefore fuffer no weeds to feed on the hop-ground.

The common fize of the hills, when they are fully completed, is somewhat more than two feet broad, and about a foot and a half high. In low, moist, or rich grounds, the hills should be higher and larger: but in dry, shallow, higher grounds,

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they are made fmall. The higher hills produce larger roots and binds, and better fets.

In August, when the hops begin to be in bell, pare again all the alleys clear from weeds, with a hoe, or sharp shovel, and throw the lightest of the earth on the tops of the hills, so as to make them as large as a bushel: but be careful not to throw on any weeds, nor to cut any of the binds with the shovel. Then too, especially if the hops are deficient in point of vigour, a good deep stirring of the alleys will be of singular service to them. At the same time, or rather before, women should be employed to strip the leaves from the vines to the height of two or three feet above ground, in order to give the hops more air and sun, and to help their ripening.

Hops, in the usual way of managing them, are often so greatly checked in their growth by a very dry spring, especially at the time when they should branch most, and even when in blossom, that it becomes necessary to water them, either by over-slowing the alleys, by means of a stream properly situated to be conducted thither, and then paring off their surface and laying it upon the hills to keep it moist; or even by the more tedious and expensive method of bringing water in wheel-barrow-casks, and pouring a pail-ful into a hole made with a stick, in the middle of each hill:

hill; and if the weather still continues dry in the summer, this must be repeated two or three disferent times. Can any thing be more striking, than the vast advantage it must be of to cultivate hops according to the plan of the horse-hoeing husbandry, particularly, if done in my way by cross plowing in the alleys, by which the earth will be kept constantly loose, and thereby moist, even in the driest seasons? This highly deserves the most serious attention of every hop-planter.

Towards the latter end of July, hops begin to bloffom, about the beginning of August they bell, and, in forward years, they are sometimes ripe at the end of August, or beginning of September. When they begin to change colour, or are easily pulled to pieces, when they emit a fragrant smell, and when their seeds begin to look brown and grow hard, they may be considered as ripe: then pick them with all expedition; for a storm of wind will do them great mischief at this time; and hops picked green and bright, without bruising or discolouring, will fell for a third part more, than those that are otherwise.

When the poles are drawn up in order to be picked, the vines around them should be cut asunder, at the height of about three or four feet from the ground; for the cutting of them lower, especially while the hops are green, would occa-

fion fo great a flowing of the fap, as would weaken and hurt the root.

If the poles stick so fast in the ground, as not to be taken up without difficulty, and hazard of breaking them, they should be raised by a piece of wood in the nature of a lever, having a forked piece of iron, with teeth on the inside, fastened within two feet of the end.

The most convenient way of picking them is, into a long square frame of wood, called a bin. This frame is made of two poles, or pieces of wood, each nine or ten feet long, and three or four inches thick, joined together at about a foot and an half from each end, by two other pieces three feet long, and supported by four legs three feet and a half high, fo that there remains in the middle of it a space of fix feet long, three wide, and three and an half deep. In this space is fixed a coarse linen cloth, or hop-bag, cut open on one fide, and hung hollow, either by hitching it on tenter-hooks along the infide of the frame, or by flitching it on the outfide with wooden skewers, to receive the hops as they are picked. Three men or women, or four boys or girls, may stand at each fide of the frame, and pick two poles at a time of the seiner of about this or do as grabula

When some poles are raised, bring them with the hops and vines on them, and lay them length-

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wife upon the frame; or erect a forked prop at each end of the frame, and rest the poles thereon when picking. There is no occasion to strip the vines or haulm from off the poles, before they are picked. The workman who raises the poles generally carries them to the frames; and thefe, being light, may be eafily removed from one part of the hop-ground to another.

The ripest hops should be first picked: but if the hops appear to be equally ripe, in all parts of the plantation, it is best to begin to pick them on the east or north side of the ground; the more effectually to guard against the fouth-west wind's breaking into the garden.

Having chosen a spot of ground which contains eleven hills, place the bin upon the hill which is in the center, and after these are picked. remove it into another spot of the same extent; and so proceed till the whole is finished.

The hops should be picked as free as possible from leaves and stalks: for these would be of greater prejudice to the fale, than any feeming advantage which might be expected from their weight. The bin should be emptied two or three times a day into a large cloth of clean linen, in which the hops should be immediately stitched up with skewers, and carried directly to the oast, or kiln, to be dried: for if they remain long in the bin

bin, or cloth, they will fweat, and be difeo-

If any brown hops are met with in the picking, care should be taken to separate them from the rest, by putting them into a basket by themselves.

If the weather be very hot, or rainy, cut no more hops than may be picked in an hour: but, if it be possible, gather them in fair weather only, and when they are dry; for this precaution will fave some expense of coals, and contribute to the better preservation of their colour when they are dried. No hops should be gathered when the dew is on them; for that would make them become mouldy.

When the poles are taken from the hills, twift together the remaining ends of the binds; that they may not get among peoples legs, and hinder their work:

Before the poles are drawn, observe whether the hops of one pole he entangled above with those of another, and if they are, cut them asunder with a sharp hook fixed at the end of a long pole.

If the garden be large, it may be worth while to raife a fined in the middle of it, to shelter the pickers and the hops from the sun and rain; and to lay hops in over-night, to be picked carly the next morning, before the dew is off the the other hops. This shed will also serve for preserving the poles in winter.

If there be either rain or dew on the hops at the time they must be gathered, shake the pole, and they will dry the sooner. If they are overripe when gathered, they will fled their feeds, in which the chief strength of the hop confists: nor will they then look fo green, but fomewhat brown, which is a great diminution of their value. It is better therefore to pull the hops a little before they are ripe, than to wait till they are full ripe. Four pounds of undried hops, thorough ripe, will make one pound of dry; and five pounds of hops scarcely ripe, though in their full prime, will make no more when they are dried. wat said not beauth although the back

There are two principal forts of hops, viz. the green and the brown. The former, yields by much the best colour when dried, and the other, is the most plentiful bearer.

Brown hops are fit for brown ale; but the hops for fine pale beer must be green; for which reafon these last are most esteemed.

As fast as hops are picked, they should be dried on a kiln; otherwise they will change colour: but if that cannot be done immediately, and they must be kept a little while, spread them on a floot

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floor, by which means they will receive little da-

They who have five or fix acres of hops, may employ ten frames at a time in picking.

If any of the rath-ripe, or early hops, which bloffom, and ripen, a week or ten days fooner than the other forts, happen to be intermixed in the fame plantation, they should be carefully watched, that they may be gathered in time; for if they hang till they are over-ripe, they will fhed their feeds, turn brown, and thereby not only become bad themselves, but spoil the sale of the others with which they are mixed. It is therefore adviseable to mark, at the blofforning season, the hills in which they are, in order to dig them up and replant these spots: for the trouble of pulling them up separately, when they are scattered here and there in a hop-ground, and of carrying them, fometimes a confiderable way, to a convenient place, to be picked, is very great, and cannot be avoided otherwise than by either banishing them totally, which would not be quite confistent with the husbandman's profit, as they fetch a good price by coming first to market; or, which is the best way, by planting them in a garden by themselves.

Very particular eare should be taken, that the hops be thoroughly and equally dried. In this lies lies the greatest difficulty and art in the management of them: for if they are over-dried, they will change their colour, look brown, and be judged to be burnt; whereby their value will be greatly diminished: and if they be under-dried, they will lose their colour and flavour. Experience has shewn, that a handful of under-dried hops will spoil many pounds of others, by taking away their fine smell and colour.

The best way of drying them is with a charcoal fire, on a kiln covered with hair-cloth, of
the same form and fashion as is used for drying
of malt. It is found to suffice in places where
only a few hops are raised, and a great deal of
malt is made; but where the hop-planters have
a much greater quantity of hops than can be
dried in due time on their malt-kiln, (for hops,
as was said before, ought to be dried as soon as
possible after they are picked) they build, in the
following manner, several small kilns, on purpose
for drying of hops.

Eight or ten acres of hop-ground require a building of about fixty feet long, and fifteen feet wide in the clear.

At one end of this building is a boarded room, to receive the green hops which are brought from the hop-ground, and which lie spread out there till there be room to put them on the kilns; at

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the other end of the building is another large boarded from, for receiving the hops from the kiln when they are dried, and for them to lie in heaps to fweat, till they are fit for bagging. In the intermediate part of the building, three or four kilns, of eight or ten feet square each, are constructed thus, close to one another.

We will suppose the middle building twentyeight seet long and sisteen seet wide; there will
be room for three kilns of eight seet square each
in the clear, and for their respective walls. These
kilns should be in a line along the back wall,
and will project from it above nine seet; so that
there will remain a passage sive seet wide and
twenty-eight seet long, at the front of the kilns.

To form each kiln, build the walls of brick, nine inches thick, and let each of the four fides be eight feet long in the clear, and feven feet high. The principal parts of the kiln are, in the uppermost part, the bed or floor whereon the hops are to be laid to dry; and in the under part, the furnace, steddle, or lanthorn, for the fire. The bed or floor in a kiln of eight feet square should be about six seet from the lower floor, so that it will be about a foot below the top of the wall. This soot of wall rising above the bed, serves to keep in the hops upon the kiln,

kiln, and for men to walk on round about the kiln, to look to the drying of the hops.

The bed or floor may be made of wooden bars an inch fquare, laid very even and level into a cross beam, a quarter of an inch asunder; or, if the kiln be arched below, the floor may be laid with long bricks, or stones, resting on the tops of the arches, at about two inches distance from each other.

In making the lower part of the kiln, place the mouth of the furnace at the bottom, in the middle of the front wall of the kiln, and let it be fourteen inches wide and fixteen inches high? Joining to the mouth on the infide build the steddle or lanthorn of brick, four inches thick. This lanthorn should be fourteen or fixteen inches wide, and three feet perpendicular in the fide walls, and it should reach from the front wall of the kiln to within a foot and an half of the back wall; fo that there will be room for a man to pass between it and the back wall, and the length of the lanthorn thus made will be about fix feet. On its fide walls, bricks of a foot long are to be raifed on their ends, leaning to and bearing upon one another, fo as to form a covering like the roof of a house; or the top of the lanthorn may be regularly arched over.

In building the fide walls of the lanthorn, after

having laid the two first rows of bricks, leave at the end of every brick in the three or four following rows, an open space or hole, four or five inches wide, chequer-wife, both in the fides and back, and lay the uppermost row or two of bricks close together, as in the bottom rows, for the better support of the roof. By these means there will be three or four rows of holes, which are designed to convey the heat equally to all parts under the hair cloth. The roof should be well plaistered on the infide, to reflect the heat. In the front part of the kiln, on one fide of the furnace, and two feet high from the ground, a fmall door should be made, three feet high and two feet wide, so that a man may easily get in to fet every thing to rights about the steddle. There should also be steps to rise to the upper sloon where the hops are dried; and as there is a paffage below, five feet wide along the front of the kilns, fo will there be directly over-head on the upper floor, a like passage, which will be useful in bringing the green hops from their room, and laying them on the kiln, and for carrying them to the flore room after they are dried. For greater conveniency, both these rooms should be on the

A further caution necessary to be observed, is, that no holes be made within a foot of the fire-

fame floor as the upper part of the kiln.

place or mouth of the furnace, and that all the parts about the kiln be constructed so close, that no wind or air can possibly get in. The farther end of the steddle should be built of bricks up to the top, with holes in it as in the sides.

The kiln should be square, and may be ten, twelve, or sourteen seet over at the top; but there should be a due proportion between the height and breadth of the kiln, and the size of the steddle where the fire is kept, viz. if the kiln be twelve seet square at top, it should be nine seet high from the fire, and the steddle should be six seet and a half square; and so proportionably in other dimensions. These kilns are made at small expense.

In drying of hops, first lay the hair cloth very even on the bed or sloor of the kiln, and spread the green hops thereon, about six inches thick; laying them with a rake as smooth as possible, not thicker in one place than another. Let the kiln be moderately warmed before the hops are laid on; then keep an even and steady fire under them, but not too sierce at first, for sear of scorching them; and let not the fire slacken, but rather increase it till the hops are nearly dried, left the moisture or sweat, which the fire has raised, fall back and discolour the hops.

For these reasons it is, that no cool air should be

be suffered to come into the kiln, while the hops are drying; and that wind which would make the fire burn too violently, should not be permitted to blow on the mouth of the furnace. After the hops have lain thus about seven, eight, or nine hours, have left off sweating, and leap up when beaten with a stick, then turn them upside down with a broad malt-shovel, or scoop made for that purpose; or cast them up into a heap in the middle, and afterwards spread them equally on all sides.

Let them remain in this fituation for two or three hours more, till every hop, if possible, be thoroughly and equally dried; and then, with a hair-cloth, remove them to the heap where they are to lie till they are bagged.

If they do not dry in one place so much as in the rest, which may be perceived by touching them with a stick or wand, and observing whether they rattle when so touched, as they will do when dry; make them thinner in the places where they rattle least. They must not be turned while they sweat; for that will burn them, and make them lose their colour. The fire may be diminished a little before they are turned, and restreshed again afterwards; but, these times excepted, the heat should be kept as equal as posssible. Hops are fully dried, when their inner stalks become brittle, and break short on rubbing; and when their leaves fall off easily, and scel very crisp. When they crackle and leap a little, as they will do upon the bursting of their scells, then is the time to take them off the kiln.

If the fuel used for this purpose be either wood or turf, it should be charred first; because smoke spoils the colour and smell of hops.

Charcoal made of old rotten poles is most commonly used. Cinders of sea-coal are also very good, and give a constant uniform heat. The fire should be made at the mouth of the furnace only; for the air will fufficiently difperfe the heat from thence to all parts of the kiln; and that it may be constantly of the same gentle degree, neither too firong nor too weak, it may be of service to make use of a thermometer; by marking upon which the degree of heat proper for drying hops, as foon as that degree is afcertained by experiment, the fire may always be regulated with great exactness: for by putting the thermometer withinfide the kiln for a fhort time, it may be observed, from the height of the liquor, when the heat is come to a proper pitch: and when too high or too low, increase or flacken the fire accordingly. Any fervant may, with the help of this instrument, be able to mend and VOL. II. correct

correct the fire with great certainty, and not be liable to commit mistakes, which often prove exceedingly detrimental to the hops. The drying once begun, lose no time in the prosecution of that work, but employ people night and day, to attend it with the utmost care, till it be finished. A large malt shovel full of charcoal, thrown into the mouth of the furnace of a kiln eight seet square, will last an hour.

It has been observed, that hops dried in the sun lose their richness of flavour; as other herbs do likewise when so dried. If they are laid on a floor to dry, without using a fire, they will lose their strength, be apt to sweat or ferment upon change of weather, and not be fit for packing. Fire exhales their watery parts, and, by retaining, preserves their slavour and colour.

It may not, perhaps, be improper to suggest here, that the kiln which I formerly described for the drying of wet grain, or for malt, is also much more simple and better contrived for the drying of hops, than those now in use: since my kiln may be increased to any degree of heat, with common suel, without any danger of sinoak; which is not altogether the case with those of the present construction, even when charcoal or cinders are employed: for from these, also, there is often a noxious steam or vapour.

If kilns of this construction were found to anfwer, it might be necessary to raise the side walls
two or three seet, by way of parapet, to retain or
prevent the hops from falling over: or they might
be made of deal, and about four or five inches
from the tyle floor, bars of wood might be laid
across, as practised in the kilns above described;
and over these bars would lie the hair-cloth, on
which the hops are to be spread.

Hops break all to powder if they are bagged hot from the kiln. To prevent this, they should be laid in a heap, to sweat and grow tough; and if they are then covered for a while close with blankets, to keep the air from them, they will bag the better. There is no limited time for their sweating; that varying according to the weather: three or four days are commonly sufficient; but it is a certain rule, that when the hops feel moist and clammy, and can be squeezed in the hand, or trodden close, without breaking, they are then sit for bagging. The harder they are trodden, the better they will keep.

The bags most proper for this purpose are made of coarse linen cloth. They are commonly about eleven sect long, and near two yards and a half in circumserence, and contain about two hundred weight and a half of hops. The small bags, called pockets, contain about half that weight.

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The manner of bagging is thus: make a round or a fquare hole, but a round one is most convenient, about twenty-fix or thirty inches over, in the floor of the chamber where the hops are laid in heaps after they have been fweated. This. hole should be large enough to receive the bag, and for a man to go up and down it with eafe. Tie, with a piece of packthread, a handful of hops in each lower corner of the bag; to serve as handles for the easy lifting or removing it, and with packthread fasten the mouth of the bag to a frame, or hoop, somewhat larger than the mouth of the hole, that the hoop may rest on its edges ; and let it be strong enough to bear the weight of the hops when the bag is full, and of the man who treads them. The upper part of the bag being then fixed by the hoop, let the rest of it hang down through the hole; but not fo near to the lower floor, as to touch the ground : then throw into it a bushel or two of hops, and let a man go into the bag, and, with shoes that have no heels, tread the hops down on every fide, as hard as he can, till they lie close. Let more hops be then cast into the bag, and be trodden down, as before; and continue this till the bag is full, When that is done, untie it from the hoop, let it down, and few up its mouth as close as you can; observing at the same time, to tie up some hops

in the upper corners, as was done before in the lower. The harder the hops are pressed, and the closer and thicker the bag is, the longer and better they will keep.

When they are thus bagged, lay them on a boarded floor, and in a dry place; for dampness would injure them greatly. At the same time all proper measures should be taken, to guard against rats and mice, which, though they do not eat hops, are very apt to spoil them, by making nests and lodging in them.

Some, in treading the hops, use a fifty pounds weight, sastened to a rope and placed in the middle of the bag. The man in the bag treads about it with his feet, and lifts it up now and then, to press them the closer together.

As foon as the hops are picked, strip their haulm or vines from off the poles, and, as your last work, lay the poles up so that they may be preserved. This is done, either by stacking, piling, or housing.

The stacking is performed thus. Set up three poles, like an erect triangle, or rather six poles, let into the ground with an iron crow, and placed circularly, but inclining to one another so as to meet, and be tied fast together a yard from the top, with bands made of the haulm of the hops. The poles destined for the same stack, should

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then be crected speedily against this frame, for if they are suffered to lie on the ground, especially in wet weather, they will receive more damage in a fortnight, than by their standing out, upright, all the rest of the year, When they are set up. about three hundred to a flack, bind them round with a rope of twifted haulm, to keep them together. By fuch means, the outer poles only are subject to the injuries of the weather, and keep all the inner ones dry, excepting at their tops and bottoms, the former of which are, for the most part, exposed to the air, as the latter are to the moisture of the earth. It is therefore a good method, to cover the tops of the flacks with haulm and to lay stones, bricks, or fand, at their both tom, to preferve their but ends from rotting.

Many choose to pile them up length wise in different parts of the hop-ground, laying three or four old poles athwart at bottom to preserve them from the dampness of the earth, and setting several poles erect in the ground on each side of the pile, to prevent its slipping; the poles are then laid on one another, placing the smaller ends inwards; so that the pile should consequently be somewhat longer than the poles; and when it is raised high enough, they bind it across with ropes of hander, to keep it upright and sleady, and then dover it with haulm, to defend it from the rain.

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This is a better way than the former. But the best way of all to desend the poles is, to build in the hop-ground a shed or two, which may serve as a shelter for picking the hops in summer, and for laying up the poles in winter, with least danger of their being hurt or stolen.

From October to March, there is nothing to be done in the hop-ground, but to provide and bring manure into it, and to give the alleys their winter's plowing or digging.

The dung brought into the ground must be well rotted, and laid on the alleys to mix with the earth, but not on the hills; dung being apt to produce vermin, which are extremely injurious to hops. Cold dung, such as that of cows and hogs, is better for hops, than home dung, unless the foil be cold and wet, and then hot dung, such as that of sheep, and even of pigeons, will not be improper.

A small dunging every second year is sufficient; and a plentiful dunging will serve for three years, if the soil be tolerably good.

Dung was formerly more in use for hop-grounds than it is at present; experience having shewn, that lime, lime-stone, gravel, sea-sand, marle, especially the shelly marle, ashes, and many other manures and composts, which have been pointed out in my former essay, as the most proper means

of correcting the defects of foils, answer the end much better, and last much longer.

The management of the hop ground during the third and every subsequent year, for it will continue to yield good crops upwards of twenty years, if rightly cultivated, is the same as above directed; so that it will require pretty constant care and attendance, especially from the beginning of March to the end of September. This may be laid down as a certain rule, that the greater the pains that are taken, and the greater the expence bestowed on the due culture and management of the hop, the greater will be the profit.

The charge of an acre of hop-ground, in most parts of England where hops are cultivated, is computed thus not seem to be a seem of the computed thus not seem of the computed thus not seem of the charge of the cha

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pay four or five pounds yearly for the rent of the

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The hop-planters in England commonly agree with hop-dreffers, to do for three pounds, to three pounds ten shillings an acre, all the husbandry part, in which is included the fummer and winter digging of the ground, the pruning and dreffing of the hops and hills, the poling and tying, feveral hoeings, and making up the hills from time to time, the laying of the dung on the ground, and all other work, except the bringing of the dung to the ground, and for picking and drying of the hops, which last businesses are performed by others: fo that a gentleman has little trouble with his hop-ground: he need only be careful that the contractor does every part of his work in the proper feafon; and it is fo much the interest of the contractor to be punctual in this, that, if he neglects hoeing when the weeds appear, he will, by fuch neglect, greatly multiply his trouble and labour in rooting them out afterwards ring an Las , says sagaithal marair shaner

An English acre requires about three thousand poles, the price of which varies according to their fize. In several places, it is usual to give as many shillings for a hundred poles, as the poles are sect long; so that for a hundred poles of twenty sect long, they give twenty shillings; but where poles are in great plenty, they give but sisteen shillings for those of that length. A supply of sixe hundred

dred poles yearly, will keep a hop-ground in conflant repair: so that poles are about one-third part of the yearly charge, the picking and drying are estimated at nearly another third, and the rest is laid out in the managing of the ground.

The hop-planters in England reckon that they have but a moderate return, when the produce of an acre of hops does not fell for more than thirty pounds. They frequently have fifty, fixty, eighty, or a hundred pounds for an acre; nay, fome have had confiderably more than even this laft fum, at a time when the crops of other hopgrounds have failed in general, and theirs have fucceeded. But if, on one hand, fuch extraordihary profits are fometimes made; fo, on the other, it should be considered, that they are attended with much uncertainty, and that crops frequently faili Upon the whole, if the total charge of an acre of hops is computed, as above, at fifteen pounds fifteen shillings a year, and its produce at an average of years at thirty pounds only, the clear profit from an acre will be fourteen pounds five shillings a year, which is nearly cent. per cent. on the out-layed as polog borband a not syn high

Though it be common for ten, twenty, thirty, or even more acres of hop-ground to be in the hands of one man; and though fome, who spare neither care, industry, or expence, to make their plantations

plantations of this kind flourish, receive two thoufand pounds a year for their hops, notwithstanding the high price of labour, manure, and every other article relating to their proper management, yet, the intelligent hufbandman will eafily perceive, that it is not prudent for poor farmers, or men of small fortune, to engage far in this branch of improvement: for it requires a pretty confiderable flock at first, to cultivate a large plantation, and to perform every other requifite. The expence will necessarily be great, and the farmer who undertakes it must expect to lie out of his money for two or three years, before he can have any return of profit; and even when his hops come to their bearing state, and he flatters him felf with being able to make good the charges he has been at, a bad feafon may frustrate his expectation. Small parcels of hops, fuitable to the abilities of the farmer, for even the poorest may eafily fpare time and labour to plant a few of them in a corner of his garden, or other ground, and to plant fallows, willows, or ash, for poles, in his hedges or elsewhere, will yield him pretty profit, without his laying out any money: fo that, in letting forth the expences and rifk which attend the culture of hops, it is only meant to caution the hufbandman, whose circumstances are son that is to the remaining disperied feeds

not affluent, against embarking too far in this ex-

Hops, like other vegetables, are liable to various accidents and distempers, the principal and most fatal of which are, the sly, the sen or mould, the mildew, and what the planters call fire-blasts.

The Rev. Dr. Hales, who made many curious experiments on this plant, has observed, that it imbibed and perspired an amazing quantity of moisture, and that this perspiration being stopped, or even impeded by any accidental cause, such as a long tract of dry weather, followed by close, foggy, and damp days, would hinder, in some measure, the kindly perspiration of the leaves, whereby the stagnating sap would be corrupted, and breed mouldy sen, which often spoils large portions of hop-grounds.

The planters of hops remark, that when a mould or fen, has once got possession of any part of the ground, it soon over-runs the whole; and that even the grass and other herbs under the hops, are insected with it. The reason probably is, that the exceeding small seeds of this quick-growing mould or moss (for such in fact it is); coming soon to maturity, are easily blown over the whole ground; and it is undoubtedly owing to the same cause, that is, to the remaining dispersed seeds

of the preceding year's fen, that some grounds are insested with this distemper for several years running.

Particular care should therefore be taken to keep the land always in fine tilth, and free from weeds, and to burn all the fenny hop-vines, in a place remote from the garden, as foon as they are picked. A forcing-pump for throwing water, with some violence, against the mouldy vines and washing the leaves of the plants, will be of great fervice, in destroying this moss, or fen; and if, instead of pure water, a weak decoction of coarse tobacco were made use of on these occasions, it would most probably answer two purposes at once, by removing the fen, and destroying the fly and other infects peculiar to hops. The forceing engine may thus be repeatedly employed three or four times in a season; for it may do great fervice, and it never will injure the plants. I have already mentioned the powerful influence of tobacco in other shapes over infects, and I cannot give a stronger proof of it, than what has been furnished to me by my worthy friend Mr. Small, who having in his window in the country, a beautiful geranium, which was nearly destroyed by a vast number of small and almost transparent infects, which fly a very little way, washed over part of this plant with a strong infusion of tobacco. The little od

little infects were not however killed thereby, but fled and covered the adjoining window with their numbers. Another washing completed the cure: there was no longer an infect to be feen, and the plant, thus relieved, put forth fresh shoots immediately after, though then the 17th of November.

Mr. Small made another experiment of the fame kind upon a myrtle, infested with a very different infect, peculiar to that plant, and which adhered to the leaves like a loufe. He effected the cure of this by the fame means as before.

I have related these circumstances, in order to shew the hop-planter, what may be done by the proper application of a decoction or infusion of tobacco. It is however to be observed, that this will not do after the plant is in flower; for it might then leave behind it a very disagreeable and prejudicial flavor. As the hops bloffom in autumn, they are more peculiarly liable to the breeding of infects, or to their being invited by the fweet moisture; or the moisture may so unite the bloffoms together, as to render them unfit for ule. A current of air from the fouth-west is in this case highly necessary; and if such current does not foon fpring up, the plants should be watered, without infusion, by a forcing-pump, before the pernicious dew shall harden

It has been alleged, that the mould, or fen, may almi!

be prevented in hop-grounds, by the use of hog's dung; and that it has been known to have cured fruit-trees attacked by this distemper. Mr. Mortimer gives an instance of an apple tree very much over-run with moss, being entirely cured by making around it a stye, in which hogs were fattened: but for my part I attribute this cure, and indeed all others thus performed, to the health and vigour given to the plant by this copious manuring. In short, the great secret with respect to the hop is, to have the ground in good heart, to stir it well, keep it very clean, use the forcing-pump frequently, and let it be well aired; and there is no great danger of unsuccessful crops, in tole-rable seasons.

In confirmation of my fystem, it is related by the authors of the Journal Economique, that a naturalist having been excited to examine the cause and nature of the mildew, he, with the assistance of a microscope, perceived it to be full of the eggs of little insects, which sly in vast numbers in the air while the hop is in blossom. These insects gnaw the leaves even of trees, and, like others of their species, undergo various metamorphoses. This discovery induced him to believe that, as insects are not apt to attack persectly healthy trees, or vigorous plants, but such only as are seeble and sickly, the hog dung might give such vigour to the

the hop, as to render these little animals asraid to attack it: for it has been remarked, that the infects which nip a leaf, quit it as soon as they find in it an abundant juice, the salts of which, it may be presumed, are too strong for them; and that they fix on those only which begin to decay, and lose their sap.

It is added in the same Journal Œeonomique, that when hops are scarce, their leaves and sprigs ought to be gathered, for several useful purposes: but they must be gathered with great care; no leaves should be taken, but such as are clean, young, whole, and green; and only the tips of the sprigs that are green, young, and sull of juice. They must be dried in a very clean and airy place.

These may be used in brewing, for an asterbeer, or for common small beer: for by throwing in the leaves and sprigs of hops, that beer acquires additional strength, becomes the more wholesome, and will keep the longer.

The leaves and sprigs of hops are, during the excessive colds of winter, an excellent cordial to cattle, whom they strengthen prodigiously.

The method of using them is, to insuse them in boiling water, and to mix this insusion with the ordinary drink of the cattle.

Respecting the fire-blast, which I consider merely

merely as a blight, occasioned by sultry sun-shine, after showers of rain: if that blight causes any decay in the plant, which may breed insects; or if it leaves behind it, that thick honey-dew already described; the only probable remedies I know, for removing these evils, are what I have mentioned above.

## SECTION II.

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## Of HEMP.

THIS plant and the feed from which it is produced, are already fo well known in all countries, that it would be needless to describe either of them here; though it may not be improper to remark, that the flowers and the seeds of hemp always grow separately and on different stems, and consequently on different plants, as this never has more than one stem proceeding from the same root.

The flower-bearing species, which is most frequently termed semale hemp, should more properly be called barren hemp, flowering hemp, or male hemp; since it is this which bears the farina Vol. II.

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facundars, of fecundating duft, without being impregnated with which, the feed that grows on the Rems of the other fpecies would not come to maturity, or at least would not be capable of producing plants, when fowns oils bedieved when

The other fpecies, which bears the feeds, and is improperly termed male hemp, should be called feed-bearing hemp, or female hemp; because it is this which, with the help of the impregnation it receives from the farina facundans of the male, produces feeds capable of yielding plants of either fpecies.

What may chance to be the proportion of male or female plants in a hemp-ground, cannot possibly be gueffed, at the time of fowing, as no fort of mark can be differred on the feeds, by which they might be diffinguished! nor indeed can any judgment be formed, till the males begin to flower, that is, till about two months after the fowing; unless it be from a remark, which curious obfervers have made, that the male-hemp is more flender than the female, and that all its parts are more delicate: to which may be added, that the male plant is always most forward in its growth. and that it generally rifes about half a foot higher than the female; by which means the fecundating dust is more easily conveyed to the feed-bearing, or female plants, him and a manufacture of the farmilines.

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With regard to the climate that is fittest for the growth of hemp, M. du Hamel has justly observed, in his treatise on Cordage, that this plant does not require much heat, but that temperate climates fait it best, and that it thrives very well even in pretty cold regions, such as Livonia and Canada, which produce it in abundance, and very good. M. Marcandier is indeed of opinion, that though extremely hot countries are not favorable to its growth, yet, as this plant is but a short time in the ground, it may be cultivated in any place that is habitable by men.\*

The legislature of this country gave formerly a bounty for the importation of this article from North America, which, I suppose, is continued to our remaining colonies of Nova Scotia and Canada. The parliament of Ireland would do wisely to give large encouragement to the culture of it, on the reclaimed bogs of that country, where it would succeed well, and might become a very great national object.

A good foil for hemp is a fost rich learn, easily brought into fine tilth, and it should be well manured.

Land newly broken up is found to be peculiarly fit for this plant; but flat grounds lying on the fides of rivers, and enriched by the fediment

<sup>.</sup> Traité de la Culture du Chanvre.

or filth left on them when the waters overflow, are the best of all.

If hemp is to be fown on very strong soils, they must be brought into so good tilth, and be so well managed, that their mould may remain loose: in which case, such soils yield great crops. Dry lands are not sit for hemp: it does not rise well in them, but remains short and stunted in its growth, and its sibres are then generally woody, which renders them hard. All these are considerable desects, even for the coarsest works.

It is however true, that, in rainy years, it fucceeds better on dry grounds than on moist: but according to the common run of seasons, the best fituation for this plant is certainly along the side of a stream, or a ditch so full of water, that the water may constantly be nearly on a level with the fursace, but without overslowing it while the hemp remains on the ground.

This is exactly that fort of fituation, which hemp might have in reclaimed bogs, where it might also be manured by the filth or sediment from the great drains.

It is the custom in some countries, to form hemp grounds, which are appropriated solely to this purpose. Were that eligible in any situation, I think it would be in such as I have just.

A There'de la Giller de Charent.

now mentioned; but in general I should prefer a change of crops.

It has been commonly imagined, that a crop of hemp impoverishes the soil where it grows: but this, I should suppose, was rather prejudice; since the ground receives from it a very ample dressing of leaves, and the depth and spreading of the roots hollow the land so much, and leave it so loose, that a crop of wheat may be taken immediately after the hemp has been pulled, without any other expence than sowing the seed and harrowing it in; or if turnips, or a spring crop be more convenient to the farmer, these also will thrive well after hemp.

As it is effential to have the ground in exceeding fine tilth, the first plowing should be given as deep and as early as possible, in autumn, and laid up rough, so as to be well mellowed and pulverised by the winter's frost.

on purpose, and which is covered with coarse grass or other similar productions, its surface should be pared and burnt, or otherwise prepared, according to the methods I have formerly mentioned. The ground should be again plowed in February, or more early if the season will permit; and then also the manure should be laid on, whether of horse-dung, or a compost formed with

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the fcourings of ponds and ditches, when it is ripe.

Quick-lime, or marle, I should effect a very

To prepare the hemp-ground thoroughly for receiving the feed, it should have two or three good plowings in the spring; for the more frequently the ground is stirred in the spring, the better the crop will be. If any clods of earth remain after all these plowings, they should be broken by means of the spiky roller, which will reduce them completely at twice going over, if the land be perfectly dry before it be thus rolled.

The season for sowing hemp depends much on the quality of the soil. In dry, light land, it should be sown as soon as the danger of the sroft is over, in the latter end of April or beginning of May, that so it may get up early, and, by covering the ground, prevent the danger of drought. In wer, cold lands, it should be sown later; perhaps about the middle or latter end of May. But if the weather be still unsavorable at that time, that is, either too dry or too rainy, it may be dealeyed even to the middle or end of June, with good hopes of a crop. This late sowing has one advantage, that it gives an opportunity of plowing

ing late, and of thus destroying the first growth

If by any accident, the hemp grows very thin, fo as to be in danger of branching out too much, and of becoming woody, this should be an additional motive for keeping it clear of weeds, that it may remain for seed, which will be the better for the plants having stood thin.

The carle, or male hemp, which produces the farina facundans, ripens earlier than the fimble or female, generally by three weeks, or a month; but the time of the ripening of either depends much on the foil and feason. The male hemp is ripe, when it turns yellow at top and whitish at the bottom of the stem; but this fort, in particular, should be pulled before it is quite ripe; for if too ripe, its fibres will adhere so strongly to the reed, as not to separate without some loss; neither will they be soft, and consequently not so fit for domestic uses, as those of hemp that is pulled before it has attained to a perfect maturity.

The ripencis of the female or feed-bearing bemp is known, not only by the same signs as that of the male, but also by the seeds beginning to turn brown, and by the capsules which contain them beginning to open.

As foon as the male hemp is ripe, it is pulled.

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ftem by ftem, and with caution not to injure the female hemp, which, as was before observed, must remain on the ground fome weeks longer till it also is ripe, and then it should likewise be pulled flem by flem. . Loov stranged to have

Each handful that is pulled should confist of plants as nearly as possible of equal length, and their roots in particular should be placed as equally as can be. Some tie up each handful, especially of the male-hemp, with a stalk of hemp, then lay it in the fun to dry its leaves and flowers, which they afterwards beat off by striking it against a tree or wall; they then put feveral of thefe handfuls together, fo as to form a pretty large bundle, and in this condition they carry it to the watering place. I had balic se blood a

This is what M. du Hamel fays of the common practice of drying the hemp before it is steeped: but it must be here observed, that it is a matter of doubt whether it should be dried, or Those who are for drying it first, fay, that the hemp becomes stronger than when steeped without being previously dried. On the other hand, those who are against drying, allege, that the fermentation required will fooner take place bos as and by the captilles which contain whim

<sup>\*</sup> Wherever I have met with the word putrefaction applied to hemp when steeped, I have always changed it to fermentation, haraft

and proceed more equally, when the natural moisture is left in the plant, and that the hardness it contracts in drying, is never after completely removed by the steeping. Experience alone, and not reasoning, can determine such a controversy.

The common height of hemp, when full grown, is from five to fix feet: but M. du Hamel remarks, that the stems of the hemp which is cultivated near Bescheviller, in Alface, are sometimes upwards of three inches in diameter at their bottom, and above twelve feet high. These, indeed, are so deeply rooted, that even a strong man can hardly pull them up.

When the fimble, or female hemp is let fland till its feed is perfectly ripe, its bark becomes woody, and so coarse that no future operation can bring it to a proper degree of fineness. For this reason, it is generally pulled before the seed is quite ripe: but as it is undoubtedly the interest of the hulbandman to sow the best seed only, he ought not to grudge sacrificing the goodness of a small portion of his hemp, to the superior advantage of obtaining perfect seed, by setting it

as it is no doubt this latter and not the former, which takes place by the steeping of hemp. It is well known, that all vegetables must have first a vinous, and secondly an acetous fermentation, before they become putrid, which is their last stage of corruption.

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fland, till the feeds have attained full maturity. But the best way of having good feed and plenty of it from few plants, is, by cultivating them on a spot apart, and drilling or dibbling them in rows distant enough to be well heed and earthed up, which will give uncommon vigour to the plants, and make them infinitely more productive both as to quantity and quality.

It is customary in some countries, to complete the ripening of the feed, to dig round holes, about a foot deep, and three or four feet in diameter, in different parts of the hemp-ground, and the handfuls of pulled hemp are fet as close together as can be in these holes, with their seed ends downward, and their roots uppermost, after which, to keep them in this position, the whole is tied round with bands of ffraw, and the earth that was taken out of the hole is thrown up all around this great fleaf, fo as quite to bury the heads of the hemp, which, when thus covered, heat, by means of the moisture contained in them, in the fame manner as a stack of green hay, or a heap of green weeds. This heat or fermentation completes the ripening of the hemp-feed, and difpofes it more eafily to quit its hulks; and when it has been brought to this condition, the hemp is taken out of these holes, where it would be come mouldy, if left longer in them. But if fland. this

this heat is given to feeds from which the oil is to be expressed, perhaps there may be some danger of the oil's being made rancid, by its undergoing this operation.

In other places, where the crops of hemp are great, the husbandmen do not bury the heads of their seed hemp in the manner above described, but only lay it in heaps with the seed ends one against another; others, whose crops are smaller, content themselves with spreading a cloth upon the ground to receive their hemp-seed; and others again, only spread their bundles on a clean spot of ground, with all the heads turned the same way.

The feed ends thus placed are beaten flightly, either with a stick or a light flail. The feed which falls out easiest, is always the ripest and best, and should therefore be reserved for sowing next spring; and as to that which remains in the heads of the hemp after this operation, it is got out by combing the heads on the teeth of a ripple, which pulls off the leaves, the husks of the feeds, and the seeds themselves, all together. These are gathered in a heap, and less in that condition for a few days, in order that they may heat a little, after which they are spread out to dry, then they are threshed, and finally, the seeds are separated by winnowing and sisting.

This fecond feed is much inferior to the first. and accordingly it is used only for extracting oil from it, or for feeding of poultry. lio and to ton

Threshing with a flail, is dangerous in bruising the feed and rendering it unfit for fowing; to avoid which, the best way is to ripple the whole, and then separate the heavy from the light, by throwing them in a barn, as wheat is thrown. and

The method of laying hemp down to fleep, is, to place it in bundles at the bottom of the water; then to cover it with a little straw to keep the dirt from flicking to it, and then to load it with pieces of wood and large flones, to keep it down, so that it may be always five or fix inches below the furface of the watering and abne book and I'l

The intention of freeping the hemp is to make its bark part the more eatily from the reed, and to destroy the outer skin. This is effected by a fmall degree of fermentation; and it would be dangerous to let the hemp lie too long in the wal ter, for it will then be over steeped, that is to fay, the water will have relaxed too much the cohesion of the fibres or threads of the hemp, and the strength of those fibres or threads would be thus greatly impaired. On the other hand, when the hemp has not lain long enough in water, its bark adheres to the reed, its fibres are hard, and they can never be rendered fufficiently fine. There HIT

is therefore a medium to be observed; which medium depends, not only on the length of time that the hemp is to remain in the water, but also,

1. On the quality of the water; it being fooner steeped sufficiently in standing water, than in a running stream, and sooner in stagnant, putrid water, than in that which is clear.

2. On the temperature of the air; for it requires less time to be sufficiently steeped in hot weather than in cold.

3. On the quality of the hemp; that which has been raised on a rich mould where it has not wanted for water, and which has been pulled while yet a little green, being sooner steeped to a proper degree, than that which has grown on a stiff or dry ground, and which has stood till quite ripe.

In general, when hemp has been steeped but a short time, its sibres are thought to be the better. Hence arises the opinion, that hemp should not be steeped but in hot weather; and for this reason also it is that many, when the autumn is cold, defer the steeping of the carle till the spring. It is likewise for the same cause that some prefer steeping their hemp in standing water, or even in stagnant water that is a little putrid, rather than in spring or running water,

M. du Hamel, to whom we are indebted for these remarks, steeped hemp in different sorts of water water, and it appeared to him, that the fibres of the hemp steeped in putrid standing water, were softer than those of the hemp steeped in running water; but in that, they contract a disagreeable colour, which does not, indeed, do any injury to the hemp, for that which has been thus steeped, is the most easily bleached; yet, as this colour displeases, and the hemp is less saleable for it, endeavours are always used, if possible, to make a small stream of water pass through the steeping places, to refresh them, and prevent their becoming putrid.

From experiments made by an agricultural fociety in Britany, it was found, that all hemp fleeped in running water was incomparably whiter than that of the fame quality steeped in standing water. That the hemp pulled before it was ripe, acquired the greatest degree of whiteness. That the whole of the loss of fubftance, upon fumming up the wafte occasioned by each particular preparation, was least upon the whitest hemp; but that the hemp steeped in standing water yielded a greater quantity of fine fibres, and the great loffes in point of quantity fell only on the first dreffing. That the hemp judged to be the best before it was hackled, did not preferve its superiority when hackled. That, that which was at first looked upon as only of a midling, or even of an infe-

rior

rior quality, proved to be the finest and best after it was hackled. This observation is of importance, especially when the hemp is for naval uses.

As it is contrary to law, that the places for steeping be made in running water, it would be of advantage to contrive them so, that the waste water from these places should run off upon pasture grounds; because the quantity of putrid vegetable matter which this water will carry along with it, would greatly enrich those grounds; and with this view likewise, all the water of pools or other places used for steeping of hemp, should be thrown out of them upon the grass, as soon as the hemp has been removed.

Care should be taken, that the hemp be not laid to steep in water in which there are any animals that are apt to gnaw it; for these would totally destroy its fibres. Of this kind are, the creatures called fresh water shrimps.

The common method of judging when the hemp has been sufficiently steeped, is, by trying whether the bark parts easily from the reed, and can be peeled off its whole length without breaking; for in this case it is thought to have been enough watered. However, it must also be altowed, that long practice enables the peasants who cultivate hemp, to give it, generally, a due degree of steeping, though they do sometimes mistake:

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but the furest way to judge of it, is, to take some of the stems out of the water and to try whether the extremity of the roots snaps off short, and whether the bark separates clean from the reed, its whole length, for in these cases it is certain that the hemp has been sufficiently watered, and should be immediately taken out. If the bark does not separate equally, but stops at the small knots on the stem, this shews it has not been steeped enough.

The usual duration of the steeping of the male hemp is from three to six days, according to the weather; and of the semale hemp, from sive to eight or ten days: but as only a small degree of too much or too little steeping is hurtful, it should be attended to with great care.

Some injudiciously neglect to wash their hemp when it is taken out of the water; thinking the filth upon it will dry and fall off of itself: but they do not consider, that in the drying, this filth gives the hemp a bad colour, and that the dust arising from it, is hurtful to the health of the workmen.

When the hemp is taken out of the water, the bundles should be untied and spread upon sand or rocky ground, or if neither of these be at hand, it may be laid on a field newly reaped and where the stubble remains standing. The stubble will keep

keep it hollow, and it will dry the fooner. Some dry their hemp by spreading it out upright, against a sunny wall, or laying it along the sloping side of a ditch.

Grass is not fit for laying it on, because there will arise from thence a moisture which will rot the hemp. For this reason it is, that the place where hemp is spread to dry, should be as free as possible from damp. When the hemp is thoroughly dry, it is bundled up again, and carried home, where it should be kept in a very dry place, till it is wanted for peeling or breaking.

The method of peeling hemp is extremely fimple; even children, and the aged and infirm may perform it with ease, by only taking one stalk after another, breaking the reed, and flipping off the bark. This may likewise become the emplayment of every person belonging to the farm; in winter evenings, and at fuch times as the weather prevents their working without doors. There are, however, fome inconveniencies attending this method: the peeled hemp comes off in ribbands, which do not answer so well in the hackling, as that which has been broken; more of the useless membranes still adhere to it, and by increafing its weight, render it better for the feller than the buyer; besides which, the hemp does not always peel off in equal lengths, and from VOL. II. thence

thence arise considerable disadvantage and loss in its future dressings the age, ve quant and and

The hemp, which is to be broken, should first be rendered very dry; because the reed will then be more brittle, and therefore part the more easily from the bark. There are several ways of drying it, but I have not seen any described, that can answer this purpose so well as my kiln formerly mentioned for drying of hops, and for various other agricultural purposes. This kiln would require being prepared with bars of wood, the same as for hops; and perhaps even the hair-cloth might be of use in this last case, as well as in the former; nor could the hemp be injured either by the fire, or the vapours which it often creates.

Upon the bars of wood, or hair cloth, the hemp should be laid about five or fix inches thick; a careful person should attend to turn the hemp, so that it may be dried equally; and also to remove the dry, and replace it with fresh quantities, as occasion may require.

Where only a small quantity of hemp is to be dried, an oven is a very safe method; and when the hemp is to be dressed at home, it may perhips be dried as fast thus, as the other avocations of the family may make it necessary. Care, however, must be taken that the oven be not so hot

hot as to endanger the fine and tender fibres of the hemp; for too great a heat may not only fcorch them, but likewife fo parch the oil in the hemp, that it will remain afterwards harfh and dry, and not be fo eafily whitened, as it might be otherwife.

By the operation of breaking hemp, is meant the breaking of the reed, which some call the bunn, or woody part of the ftem, within the bark, for the bark itself, of which is made the filamentous substance, that is foun or used in manufactures, only bends under the hands of the dreffer and does not break. The breaking is performed in three ways; by beating the hemp with beetles, which is laborious and tedious; by the Dutch hand-break, which is preferable to the beetles on by fluted rollers worked by horfes, wind, or water. This is by much the most expeditions way, but is attended with some expence in the construction of the mill. I would therefore with to recommend a machine of a much simpler construction, which is formed by an upright axle, two mills stones may be fixed to it following one another upon a circular oak-boarded floor; and the axle and stones may be turned by an arm or lever extending from the former, fo as to give the proper distance for a horse, or even men, to turn it. The hemp should be spread on the oak-X 2 floor Before

thoot.

floor above mentioned, and placed in the way of the mill-stones as they turn; and when moved about, so as the stones may have passed over every part, that quantity should then be withdrawn; and a new one put in its steady of all ton bus with

After the hemp has been broken, it undergoes a fecond operation, which is commonly termed fwingling or fcutching. The ule of this is, to feparate the reed from the hemp, and it is done in the following ways. In the first the works man takes a handful of hemp in his left hand, and holding it over the edge of a board, ifrikes it with the fharpened edge of a long, flat, and Araight piece of wood, commonly called a fwingle-hand or feutcher. Some recommend to have the cutting edge of the fcutcher made of acircular form, that its greatest force may fall on the middle of the hemp, and thereby spread it, by which means it will be more equally cleared of the remaining broken pieces of reed. But this method, being both laborious and tedious; was ter-mills have been erected, in which feveral foutches fixed in the fame axle, are moved with great velocity in In thefe, the work is performed with expedition, and much less fatigue to the workmen, but greater watte is made of the hemp, owing to the velocity with which the engine is turned it sall he heavy thould be pread on the mur

Before

Before the homp, thus prepared, is hackled, it usually undergoes a third operation, called beet-ling, the design of which is to loosen, and thereby more thoroughly separate its fibres. The beet thes used for this purpose are moved either by hand or by water.

It would be extremely foreign to my purpose to enter into any description of the implements used in the manufacture of hemp: my province is husbandry, and beyond its bounds I do not mean to go.

M. Marcandier proposes, instead of scutching and beetling the hemp, to give it a fecond fleeping after it has been peeled or broken, the better to fosten the bark that may still remain hard, and not eafily brought to a proper degree of fineness. For this purpose, the hemp intended to be steeped a second time is divided into finall parcels: these are tied loofely round the middle with a piece of packthread, in order that they may be managed cafily, without mixing or entangling them; and the hemp thus tied is laid in a veffel full of was ter, where it is left more or less time, according to the hardness of its fibres, and the quantity of glutinous adherent matter still remaining on it. Three or four days are always fufficient for this purpose; but a less time will do, if the hemp wants only to be cleared of that adherent matter. X 3 When state!

When it has been thus steeped long enough, it should be washed very clean in a running stream : and if many of the fibres of the hemp are found to cling together in what our author calls ribbands, he advises to beat them in the manner linen is beaten in bleaching. It is fafer to err in too little, than in too much steeping; because, after the fibres have been loofened in the break, they will be the more liable to be destroyed by only a flight degree of fermentation. When the fibres of the hemp are fufficiently difengaged from each other, they feem, while immerfed in water, to be as completely dreffed as if they had already passed through the backle. After this watering, the parcels are opened, spread on a board, and laid in the fun to dry, a street within the

M. Marcandier farther observes, from his own experience, that, after this preparation, the hemp may be again steeped in a lye of pot ash or wood ashes, rendered perfectly clear of all filth. This will undoubtedly contribue to the removing of any such matter still remaining in the hemp, as must necessarily fall off in the future preparations, before the manufacture made of the hemp be fit for use. And indeed a lye of this kind, bids fair to be of service in the preparing of slax as well as of hemp; because, both being thereby perfectly freed from every particle which must otherwise fall-

fall off in the future operations of hackling, fpinning, bleaching, &c. the cloth or other manufacture made of them, will be proportionably better and more durable. The time taken up in bleaching will be hereby much shortened.

In the whole of this process, the water should be warm; because warm water is softer, and acts more powerfully than cold, in dissolving the impurities which are to be separated from the hemp; and it is also an indulgence to people employed in this business, who might otherwise be more apt to stur over their work. It will therefore be adviseable to perform this operation in warm weather, to save the expence of heating the lye.

M. Marcandier having experienced the efficacy of horse-chesnuts in the bleaching of linen, and cleansing of woollen stuffs; made likewise use of an insusion of them in water, as a lye for preparing hemp in the manner above described. The method of preparing this lye is, to peel the chesnuts and rasp them as sine as possible into soft water, in the proportion of two or three nuts to every quart of water. This is done ten or twelve hours before the mixture is to be used; and in the mean while, it is stirred from time to time, the better to dissolve these raspings and impregnate the water. The last stirring is given about a quarter of an hour before the water is drawn off

from the thicker part of the raspings which subsides; and this is done, either by inclining the vessel and pouring the lye gently off, or by ladling it out by hand, while the water is yet white, and froths like soap-suds. In order to use this lye, it is made rather hotter than the hand can well bear, and the hemp is then steeped and washed in it as in soap-suds.

The hemp thus prepared is carefully dried, laying the fibres smooth, and as little intermixed as possible. When dry, it is doubled, and twisted at the ends, or tied up in bundles. The farther business of the hemp-dreffer need only be an easy beating of the hemp, and that chiefly to separate the fibres that may have clung together in the drying, and to the common operations of the hackle.

The danger for often fatal to the dreffers of hemp, from the dust drawn in with their breath, will be thus in a great measure avoided; and the hemp so prepared will be white, smooth, fost, and slexibles to over to possessed and minimum.

The same gentleman likewise informs us, that linen may be washed in the above mentioned lye: and that even when very direy, much less soap will be required, than is commonly used, it being sufficient to rub the dirtiest part only, with a little soap.

He adds, that the raspings of the chesnuts which sink to the bottom of the lye, are good food for fowls and pigs.

The

The same author extols highly the various uses to which hemp thus prepared, and even its tow, or what is separated from it by the hackle, may be applied. This hemp, he informs us, may be dyed like silk, wool, or cotton, and may be made into cloth, stuffs, and garments of all kinds; and that a great advantage attending the use of this material is, that it will not be destroyed by those insects which devour woollen cloth. These advantages attending hemp thus prepared, if they have not already been adverted to by our manufacturers at Manchester, &c. are certainly well worthy of their particular attention.

M. du Hamel gives the following directions for judging of the quality of hemp, that has been dreffed, and is ready for manufacturing.

It is of consequence that the hemp in bales, for so it is always packed, be not damp; because it would then weigh heavier than it ought, and would be apt to contract a heat, which might end in rottenness. The hemp in each head, or bundle, should be as nearly as possible of equal length, and diminish gradually from the root end to the point. That which has been broken is softer, and its sibres are more separated than that which has been peeled. From hence it would seem as if this hemp might be wrought up with less loss of substance than peeled hemp; but yet, in fact,

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it generally yields the greatest quantity of resuse; not only because it is never so well cleared from the reed, but also because its fibres being mixed and entangled with each other, a greater number of these are broken when it is hackled. It is, however, on the whole, most probable, that breaking may be the best way of dressing very hard and strong hemp, because the break certainly contributes greatly to render it soft and sine.

Too great a stress is sometimes laid on the colour of hemp: that which is of a filver or pearl colour, is reckoned the best; that which has a greenish hue is likewise deemed good; that which has a yellowish cast is less esteemed; and the dark colour only is rejected: but at the same time, it should be observed, that the colour of hemp depends chiefly on the fort of water in which it has been fleeped, that being dark which has been steeped in standing water, and that light coloured which has been freeped in running water; and therefore, that the colour of the hemp does not in fact deferve very great attention; unless it be black, or of a very dark brown. In these cases indeed, it may be prefumed, that the hemp has either been fleeped too much, or that it was packed up so moist as to have been heated in the bale. The fmell of the hemp is more to be relied on, than its colour; and of confequence, that

that which has a rotten, mouldy, or heated fcent, should be absolutely rejected; whilst that which savours strong of the natural smell of the hemp should be preferred, because this indicates it to be of the growth of the last crop; a circumstance which is much attended to in the rope yards; because, new hemp is found to waste much less in the working, than old; though it is certainly true, that it does not hackle so sine.

In general it may be laid down as a rule, that the hemp which feels foftest, and whose fibres are the finest and most equally separated, is the best.

The Rev. Mr. Mills, in his account of the culture of hemp, advises working the land well, and then giving it thirty loads per acre of good manure about a fortnight before feed time, which he confines to the month of April: but I have given a much greater latitude, I believe without danger of suffering by it.

The fooner it is fown, fays Mr. Mills, the feafon permitting, it will be the better, though it has been fometimes deferred till the 15th of May. Three bushels and a half of good bright feed are fusficient for an acre, and should be gently and lightly harrowed in. The birds must be kept off the land till the plants appear: the time of pulling is about the beginning of August, or, more properly speaking, thirteen weeks from the time

of fowing: the leaves turning yellow and the stalks white, are figns of its maturity; the male and female hemp are pulled together; indeeed when the crop is thick, it is impossible to separate them. The expence of pulling is generally effici mated at one shilling per peck; according to the quantity originally fown. of the quied went alles

When it is all taken up and bound in fmall bundles, with bands at each end, to fuch a bigness as may be grasped with both hands, it is conveyed to a pond of standing water, if la clay pit, the better, where it is laid in layers, one croffing the other, which is termed a bed of hemp; and after it is piled to fuch a thickness as to answer the depth of the water, which should not exceed four or five feet, it is loaded with blocks and logs of wood, till all is totally immerfed: after remaining in this flate four or five days, as the weather shall direct, it is taken out and carried to a field of aftermath, or any other grass, that is clean and free from cattle; the bundles being untied, it is foread out thin, stalk by stalk; in this state it must be turned every other day, especially in moist weather, left the worms should injure it; thus it remains for fix weeks or more; then it is gathered

<sup>\*</sup> I have already observed, that a field of grass is not the most favorable situation for spreading of hemp. together, mirrers weeks from the

together, fied in large bundles, and kept dry in a house till December or January, when the stalks are broken, and the bark wholly freed from them by an instrument called a breaker. The art of breaking it, by a labourer of common capacity, would be learned in a sew hours, and the swingling of it, which follows, requiring some slight as well as labour, though more difficult, might, in a little longer time, be acquired as After breaking and swingling, it is sent to the hackler and hemp-dresser, to be prepared for spinning, according to the sineness desired.

Should the hemp stand for seed, the yarn of it will never be so white, as it is not watered, but only spread on the grass for the benefit of the dews: it will not be improper to observe, in this case, that after it is ned in bundles, it is set up like wheat in stacks, till the seed will steely shed, and then is threshed out.

The hemp when it comes from the brake is tied up in stones, which will fetch from fix shillings to seven shillings and fix-pence each: in the year 1787, it sold as high as nine shillings. The produce is so variable and uncertain, that, in one season, a rood and fix perches of land has produced seventeen stones, and in another, with the same culture and manure, only twelve.

The expenses of cultivation may be thus estimated; 7 3 esponeux.

Produce.

Rent

Rent of an acre of land and and hall of trob o
Plowing and fowing, &cd. 10. 10 10 6
Three buffiels and a half of feed, fup-nestord one
posed at one shilling and fix-pence in an vi
. per peckonouna louverelet. a. int. ni point of
Boy keeping off birds, one week at least o 1 6
Pulling, at the rate of one shilling per it to dail
week, according to the feed fown o 14 o.
Getting it in and out of water, turning, shall a mi
hand laying up of the He relegion bear of
henry-deelers to be pergared for frinaing, ac-
Tithe and town charges not estimated.
The expense of breaking hemp is from one
shilling to one shilling and fix-pence per stone;
the drefling at the hackler's, one shilling and fix-
pence per stone; and the spinning, according to
the financis, from feven-pence to one shilling per
clew. A clew is three fkeins, a fkein is twenty
leas, a lea is forty threads, a thread is two yards
when reeled. The weight of a clew varies with
the fineness or coarseness of the thread.
But to continue the above account.
Tithe and rates, suppose
The lowest crop mentioned is forty-
eight stones per acre, let us suppose
only forty, breaking, at one shilling
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Produce.

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Forty stones, at seven shillings was \$ 14	0 0
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The Society of Arts in London, having received some Chinese hemp seed from the East India Company, distributed small quantities of it to those members who could most conveniently make experiments on the culture of it.

Amongst others, some of it was given to the Rev. Dr. Hinton, of Northwold, near Brandon, who, fowing it, found the crop fail from the age of the feed, which from the length of the yoyage, had been too long kept; a circumstance extremely hurtful to hemp-feed. So much grew. however, as to enable him to make trial of it a fecond year, with fresh feeds which he had faved, This feed was fowed the 10th of May, 1787, on good land in high condition, and on the 19th there was a plentiful shoot of healthful plants. which grew vigorously all the feafon. August 13th, the carle or male hemp was drawn, as on October oth was the fimble or female hemp. The produce was after the rate of ninety-five stones

Young's Annals of Agriculture, No. 51, p. 376.

feven pounds, and three ounces; and of feed, eleven bushels, two pecks, and half a pint per acre; whereas the general produce in the same neighbourhood seldom exceeds sixty stones per acre. Dr. Hinton adds, that he was not qualified to judge comparatively of the quality of English and Chinese hemp; but that in point of quantity, the latter had certainly the superiority.

fome Chinese hemp seed from the East India Company, ILL ib MeO La Qualities of it to these members who could most conveniently make

experiments on the XukuL Pi 70

THE species of this plant which is cultivated for use, is the limin satisfied of C. Bauhin, p. 214. Its stem, which is round and hollow grows erect to the height of about two seet, and then divides into several branches: these are terminated by blue flowers, consisting of five petals, and are succeeded by capsules divided within into ten cells, in each of which is enclosed a bright, slippery, clongated seed. Its seaves are long, narrow, sharp pointed, and placed alternately along the stem and branches.

The by tilth, and lituated in a valley bordering upon water por flich a foil as is thrown up by

rivers, as before recommended for hemp. If there be water at a small depth beneath the surface of the ground, it is thought to be still better; as is the case in Zealand, which is samous for its slax; and where the soil is deep and stiff, with water almost every where at the depth of a foot and an half or two seet underneath it. It is said to be owing to the want of this advantage, that the other provinces of Holland do not succeed equally well in the culture of this useful plant. Not but that fine slax is also raised on high lands, if they have been well tilled and manured, and if the seasons are not very dry.

In the letters which the Dublin Society have published on the culture of flax, it is remarked, that moist stiff soils yield much larger quantities of flax, and far better seed, than can be obtained from light lands; nay, that the seed procured from the former may, with proper care be rendered full as good as any that is imported from Riga or Zealand: but, M. du Hamel is of opinion, that strong land cannot produce such flax, as what grows on lighter ground.

In fouthern countries, the husbandmen who raise flax, sow part of their seed in September and October; so that the plants which spring from thence remain of course in the ground all the winter; and this is well judged in these planters, Vol. II.

because plants which have not covered the earth well before the heat of summer comes on, are apt to be parched in that dry season. They sow lin-seed again in the spring; but this does not yield an equally abundant crop: however, the flax which it produces is more esteemed, because it is siner than that sown in autumn. But in places where the winters are severe, and where the flax, which is a tender plant, would be in danger of suffering from frost, it is the practice to sow the seed about the end of March or beginning of April.

The land which is intended for flax should be brought into exceeding fine tilth by repeated plowings, and should be enriched by a manure suited to the quality of the soil. Thus, when a pasture is newly broken up, it should be summer fallowed, and an ameliorating, horse-hoeing crop taken, before it will be sit for slax. The Livonians, when they clear wood-land, burn the wood upon it, then plow it, and prefer it in this state to any other kind of soil, for slax.

If the ground on which flax is to be raised has been long in tillage, it should be plowed up deep before winter, and be laid up in high ridges or bouts, in order that the winter's frosts may moulder and mellow it.

In the month of February, if the land be not

too wet, some very rotten dung should be laid in the furrows, and immediately covered over. In March, for fouthern countries, or in the beginning of April where the climate is colder, another plowing should be given to lay the land smooth: the clods should be broken by hand, and the feed should then be fown and harrowed in, with a light, or bush-harrow, so as not to bury it above an inch deep. If the foil be moist and cold, a little pigeons dung may be fown with the feed; for it agrees admirably well with the flax: but this must not be done if the ground is very light and dry. If the ground be very wet, it should be laid out in beds of thirty or forty feet wide, separated by trenches to drain off the water; and if the ground be level, the water may be allowed to remain in the trenches within nine inches or a foot of the furface of the beds.

Most of our lin-seed is brought from the north, namely, from Riga and Zealand: but we may ourselves raise it very good, by following the directions here given.

Lin-feed is reckoned good, when it is large, oily, and of a good colour. To know whether it be oily, a few grains of it are thrown into a red-hot fire-shovel, and they in that case crackle almost instantly, and blaze briskly. If it be sufficiently heavy, it will sink to the bottom in wa-

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number of feeds, exactly counted, should be fown on the end of a hot-bed, and notice taken whether they all grow.

When the goodness of the seed is known, more or less of it is to be fown according as the husbandman intends either to raife a quantity of lin-feed for fowing, or to have very fine and fost flax. In this last case, the seed should be fown pretty thick, in order that the plants may rife the closer together; by which means they will grow flender and tall, which adds much to the fineness of the fibres. If the lin-seed be fown with an intention to let the flax remain for feed. a much less quantity of it should be used, that fo the plants may come up thin, and thereby have room to grow to their full vigour and extent. As ffrong foils should be chosen for this purpose; it might be most adviseable to sow it in drills, and horse-hoe the intervals. Plants thus raised, have been found to produce great plenty. of excellent feed. Some fow, with their lin-feed, annual and perennial grafs feeds, when they intend to lay the land down to pasture. The plants grow but weakly under the flax; which, however, they do not hurt; but as foon as the flax has been pulled, they increase apace, and produce abundantly. It of slott they are worself with stock

Flax is fometimes damaged by infects, when it is about three or four inches high. It is faid, that they may be destroyed by a slight strewing of foot, ashes, &c. At all events, it is certain that this dreffing will give vigour to the plants, though it should not kill the infects. It is highly probable, should these fail, that this insect, like that which infests turnips, may be destroyed by nocturnal rolling, which will not hurt the young Haxnorff one Assir set that they for olderty

If any weeds appear among the flax, as is generally the case, they must be rooted out; and that the flax may be as little damaged by this as possible, the weeders should work bare-footed: they may indeed fit down upon the flax, for that will do it no harm, but treading on it, with the heels of shoes would kill many plants.

The finest flax is most liable to be laid, particularly in countries subject to storms, To guard against this accident, the best way is to run small ropes across the field, both ways, and to tie them where they interfect at right angles, and fasten them by stakes at due distances, which will form a kind of netting that will protect the plants against almost any tempest will alar willis

Opinions are divided in regard to the degree of ripeness, at which it is best to pull flax. But in this, as in most other cases, extremes should SE WENT

certainly be avoided; and it feems reasonable to think, that the most proper time for bulling it is, when its stalks begin to turn yellow, when its leaves begin to fall, and when its feeds begin to grow brown. I de money say live shiften and

As foon as the flax is thought to have attained to a due degree of maturity, it is pulled, generally by handfuls: but as it is feldom all equally ripe, or equally firong, it would certainly be advifeable to pull first the ripest and strongest plants, and then the weakest and less ripe; for thus they would be separated at once, which is of effential fervice in the watering; because, the weak and green flax requires much lefs fleeping than the stronger and more ripe. All weeds, and the earth which adheres to the roots of the plants, should be carefully taken away, and then the handfuls of flax should be laid regularly on sicularly in countries in bicc to horter bruong sit

As the flax is pulled, it is laid together by handfuls, with the feed ends turned towards the fouth. These handfuls should neither lie quite in a line with each other, nor directly across, but a little flanting upward, fo that the air may eafily pass through them. Some, instead of this method, tie the handfuls of flax loofely at the top, then spread out their roots, and thus fet feveral of them together, upright upon their certainly

roots:

roots: thus it remains two or three days: of even one day will be fufficient in very dry weather; after which it is rippled.

If any flax is raised on purpose for seed; or if, through the dryness of the season, or the badness of the seed that was sown, the flax is come up very thin, so as to show evidently, that the seed which it may produce will be more valuable than the rest of the crop; in either of these cases, the flax should be let stand, till its seed is persectly ripe; thus sacrificing the flax itself, to the then greater advantage of having good seed.

In order to ripple the flax, which is the next operation, a large cloth should be spread on a convenient spot of ground, with the ripple placed in the middle of it. The manner of performing this work is so well known, that there is no need to describe it here. Its purpose is, to obtain the lin-seed, which is always of considerable value, even though the flax has been pulled before its perfect maturity.

After the flax has been rippled, the feed should be spread in the sun, to dry. Those which separate from the pods, of their own accord, are the fullest and ripest, and should therefore be set apart, for sowing, in case the precaution of raising flax purposely for feed has not been attended

The pods, or capfules, are then broken, either by treading or by threshing, in order to get out the remaining feeds, the whole of which, as well as the former, should be carefully sifted, winnowed, and cleaned. When the feed is laid up, it must be frequently stirred, or ventilated. to prevent its heating. Even this fecond feed affords a confiderable profit, by the oil which it yields, and also by being afterwards made into cakes for fattening of cattle, or for manure. They are however thought to make the fat of cattle vellow: for which reason it is advised not to give them oil-cakes, till within a few weeks of their being killed : or, which is better, after they are fattened with the oil-cake; take off the effect of this food, by giving them some other, for a few weeks before they are killed.

As foon as the flax has been rippled, it should be carried to the watering place. The different kinds should now be separated, if not done before; otherwise, some of the flax may be rotted in the water before the rest will be sufficiently steeped.

The choice of the water for steeping, is thus very properly pointed out in the directions for raising flax, published by order of the Commissioners for Fisheries, Manufactures, and Improvements, in Scotland.

All flax ought to be watered in canals, which should, if possible, be dug in clayey ground; because it will best retain the water: but if a firm or retentive soil cannot be got, the bottoms and sides of the canals should be well lined with clay.

"A canal of forty feet long, fix wide, and four deep, will generally water the produce of an acre.

"It should be filled with soft water from a river or brook, and if possible, two or three weeks before the flax is put in. The greater way the river or brook has run, the water will be the foster, and therefore the better. Springs, or short runs from hills, are too cold, unless the water be allowed to stand long in the canal. Water from coal or iron is very bad for slax. A little of the powder of galls thrown into the water, will immediately discover if it comes from minerals of that kind, by turning it into a dark colour, more or less tinged in proportion to the quantity of vitriol contained in it.

"The canal ought not to be under any shade; because this, besides keeping the sun from softening the water, might render some parts of the canal cooler than other parts, and thereby make it water the slax unequally.

"The flax raifer will observe, that when the

water has been brought to a proper degree of heat, by the fun, small plants will rife quickly in it, numbers of small infects and reptiles will generate there, and bubbles of air will rife up to its surface. If he such signs appear, he may conclude that the water is not warm enough, or that it is otherwise unsit for flax."

Running water is not fit for steeping flax; because, it prevents that degree of fermentation, which is necessary to separate the fibres from the reed; and besides this, in such streams, the flax is apt to be carried away by sudden floods, or to be filled with the mud and slime, which those floods bring with them; but to have a small rill of water pass through the steeping place is very adviseable, because it will supply the loss of that which is evaporated. Stagnast water which is naturally of a bad colour, should likewise be avoided; because this communicates to the flax, which is not afterwards easily got rid of.

The flax, after it has been rippled and forted, as before mentioned, should be tied very slack, with a band made of a few stalks, in bundles not larger than a man can easily grasp with both his hands, in order that the water may the more equally penetrate through them; and in this condition they should be put into the canal, sloping, or half-standing upon one end, which, say

fay the Edinburgh Directors, should be the seed end, and of course the root uppermost; because, add they, when the seed ends are uppermost, there frequently breeds a great deal of vermin destructive of the slax, and this they assure us is effectually prevented by putting the seed-end downmost. However this may be; the slax, when put into the water, should be covered with straw, or fern, upon which a wicker hurdle and some stones may be said to keep it down, but without pressing too hard against the bottom. It is a common opinion, that if the slax is not thus covered, the sun will discolour it; even though it be quite covered with water, as the seed of the sun will discolour it; even though it be quite covered with water, as the seed of the

More or less time is requisite for the steeping of the star, according to the nature of the water, the heat of the air, and the greater or less degree of woodiness of the star. It is steeped sooner with a south, than a north wind; and that which has been pulled green is also much sooner steeped, than that which has been pulled very ripe.

It is therefore difficult to fix a precise time for its remaining in the water. The way to know when it has been sufficiently steeped, is to draw a few stalks from out of the middle of the heap, and then try it if the reed snaps short, without bending, and if the bank parts cally from

from the reed, towards its point, it is enough steeped, and must in this case be taken out of the water immediately; for otherwise it will become too tender, and begin to rot.

The Livonians, when they would have flax or hemp of a superior quality, chuse a spot where there is a sall of clear water, and there make sive or six basons, or reservoirs, one under another, each of which is from one to two seet deep. The water can either be let run from one bason to another, or be stopped at pleasure. The basons are separated by slight banks; and in each bank is a little opening, which may be closed whenever it is thought proper. To prevent the stream from overflowing the basons successively, it is itself turned aside by a small bank of clay; and this bank is opened whenever the water is to be renewed in the basons.

The Livonians put their hemp and flax, first into the uppermost bason only. At the end of two, three, or four days, they remove it into the second bason, from thence into the third, and so on, till they have brought the several bundles of these plants down into the lowest. At each of these shiftings the sarst bason is filled with fresh flax, and the water is renewed in all the basons. This method of proceeding agrees perfectly well with that prescribed by the Trustees

in Scotland; and by these means the steeping is not completed till the slax or hemp has passed through all the basons, and has remained a proper time in the lowermost. Neither the English nor Dutch import any hemp from Riga, but what has been steeped in this manner; whereas the French take, at a lower price, what has been steeped in stagnant waters.

When the flax is taken out of the water, the bundles of it are spread out like a fan, at the root end, and laid on a dry new-mown meadow, that it may dry, bleach and become supple. It is there turned from time to time, and is carried off when quite dry; otherwise the moisture of the dews would have the same effect, as if it had remained longer in the water.

The disadvantage of laying the slax on long grass is pointed out in the directions for raising slax, published by the Trustees for Manusactures, &c. in Scotland, where they advise the husbandman, by no means to follow this method, because the grass growing through the slax frequently rots it. These gentlemen recommend short beath for spreading slax, after it has been taken out of the water; for if it is wet, it sastens to the heath, and is thus prevented from being moved by the wind; at the same time it is kept a little above the ground, and is thus more equally

equally exposed to the air and weather: but grounds exposed to violent winds should be avoided.

The flax, continue they, must be spread very thin upon the ground, and as it is then tender, it must be gently handled. The thinner it is spread, the better: the Livonians are particularly attentive to this, so as never to have above three stems upon one another: it ought never to be spread during a heavy shower, because that would wash and waste the bark, which is then very tender, though it soon becomes firm enough to bear the weather, and then the more rain and sunshine it gets, the better it will be.

The skilful husbandman spreads his first row of flax at the end of the field from whence the most violent wind commonly comes, placing the root-end foremost: he makes the root-ends of every other row over-lap the seed-ends of the former row three or four inches, and binds down the last row with a rope; by which means the wind does not easily get below the flax; and as the seed-ends are seldom so fully watered as the root-ends, this overlaying is like giving the seed-ends more watering.

The flax is judged to have been fufficiently graffed, when it is of a clearer colour than before, when its bark is bliftered up, when that bark

bark parts easily from the reed, and when the reed becomes very brittle: but no written defeription can possibly convey a knowledge of this point, at all equal to that which is acquired by experience.

The whole of the flax should be sufficiently grassed, before any of it is listed; for if a part be listed sooner than the rest, that which remains will be in great danger from the winds.

A dry day should be chosen for taking up the flax; and if there be no appearance of high wind, it should be loosened from the heath or grass, and lest loose for some hours, to make it thoroughly dry.

As a great quantity of flax can scarcely be all equally watered and grassed, and as its different qualities will best appear at lifting it off the grass, each different kind should then be collected together, and kept by itself, that is to say, all of the same colour, length, and quality.

The smaller the bundles are into which the flax is made up, the better they will be for drying, housing, &c. and in making up these bundles, as in every other operation upon flax, it is of great consequence, that all the stems be laid together as they grew, that is, root-ends to rootends, and seed-ends to seed-ends.

The Livonians, cut off the roots of their hemp,

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but not of their flax, when it is taking out of the steeping basons. They then tie the flax or hemp up in bundles about as thick as the lower part of a man's thigh. These bundles are placed upright, and supported by a stake, around which a few of the tops of these stalks are twisted, the better to secure them from falling. They are left in this fituation one day, to drain; they are then spread on the grass, for one or two days, and after this they are laid in heaps, and covered over with haulm, ftraw, or fome fuch covering, to make them fweat. When the hemp or flax has fweated enough, it is laid in heaps in the shade, and there dried: but these heaps must not be so thick, but that the air may penetrate into them. It is on this last operation, that the good or bad quality of the hemp or flax thus managed chiefly depends. Both of them may be kept two or three years, and even longer. upon their reeds, after they have been thus prepared; and when it is intended to break them, after this keeping, they are put into an oven properly heated.

In the common way, after the flax has been graffed, it must be dried by heat, to make its reed break readily and separate the more easily from the bark. To guard against the danger of

fire.

fire, this business should be performed in a place distant from any other building.

The general method of drying flax is, in ovens. The Livonians make theirs of clay bricks, or hewn stone. Those which are built with clay, are fometimes large enough to contain eight hundred bundles at a time: but it is more common to make them only for two three, or four hundred. They are shaped like the ovens for an army, that is to fay, they are very high arched. They require no greater degree of heat than is given with dead wood, furze broom, &c. and what is just sufficient to render the reed of the flax brittle; and the fame of hemp, for the Livonians use them for both these plants, the bundles of which they set upright in them, and as foon as they take them out of the oven, they carry them to a kind of mill, to be broken. we all has said to past of said

The Dutch likewise dry their slax in ovens; their dimensions are generally about sisteen seet in length, ten seet in breadth, and sive seet in height: the roof is arched, and the entrance, which is just large enough to admit a man with tolerable ease, is made to shut close, with a wooden door. This oven is not heated with wood, excepting at first; for after the workmen have begun to dress the flax, the broken reeds Vol. II.

and other refuse parts, which are beaten off it. and fwept up, fuffice to continue the heat; fo that each parcel affords firing for the next, till the whole is dried. The Dutch kindle the fire in the oven, fome hours before the day's work is over. The fweepings of the flax light eafily, and the oven heats and cools again, sufficiently, before the breaking and scutching is finished. They fill it when they leave work, and the next day, when they return, they find the flax dry, and fit for breaking. The flax breaks best and most easily whilst it is a little warm and orisp: confequently, the working is then cheapeft; and accordingly, the Dutch never draw two bundles together from the oven, but take them one by one as they want them. I need not observe, that when the oven is heated, it must be well cleaned before the flax is put in; for the least spark will fet the flax on fire, and this would be a confiderable lofs, as these ovens hold a great deal. It is for this reason, that I would wish to recommend the drying floors, I have before described, as fit for feveral ufeful purpofes, and for this particularly; because, they are exempt from all dangers from fire. The state of the olders of

In Britany, they dry their flax in the common ovens; only letting them cool after the bread has been drawn. The impatience of those who do this

this bufiness is such, that they seldom let their ovens cool sufficiently; by which means the flax is considerably injured, and part of it is totally spoilt. M. du Hamel, upon inquiry, sound that the proper degree of heat at which the flax should be put into the oven is, from fifty to fifty-five degrees of Reaumur's thermometer.

- two stillings per coomb, and the quantity sown is two bushels per acre.
- 2. As to manure, there is none laid upon land where flax is to be fown; but it must be clean or fwerd land.
- 3. If the land be swerd land, or what is called grass land, it must be plowed but once and harrowed fine. Rich land will bring turnips, wheat, or clover, &c. after the stax is off.
- 4. The crop, managing and getting into the barn, costs about three pounds an acre. The produce is from twenty to fifty stone an acre, according to the land. It sells at five pounds, fix pounds, or seven pounds per score.
- 5. It does not impoverish land, but rather im-

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Bath Soc. Trans. Vol. IV, p. 255.

# SoECTLON IV. Sono

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eck descers of Relumin's this mometer.

THIS plant, which is the Isatis sativa well latifolia, of C. Bauhin, p. 113, puts forth stems about three seet high, and of the thickness of a man's singer: these divide at their top into several branches loaded with leaves, irregularly placed; and these leaves are sleek and of a blueish-green colour. The branches bear also great numbers of slowers, composed of sour yellow petals disposed cross-wise: the pointal becomes a capsule slattened on the edges, and each capsule contains two oblong seeds: the root is large, woody, and penetrates deep into the ground. This plant delights in a warm climate; though experience has shown that it may be cultivated here with great success.

A light, black, kindly, and rich foil, or a meadow newly broken up, is chosen for the culture of woad; but it must not by any means be sown on stoney or shallow land. It thrives well in plains, but still better on the south side of a hill: the essential point is, that the soil be good; and

and Mr. Miller is of opinion, that it should not be too light or fandy, nor too stiff or moist; but rather a gentle hazle loam, whose parts will easily feparate want aposto and and an mid-of rewall ad

Mr. Bartley has informed us that he tried the culture of this plant on some part of Brislington common, where it succeeded extremely well: The foil a rich loamy fand, the colour that of a hazel-nut when fully ripe; the upper stratum of a pretty uniform quality, to the depth of from two feet and a half to four feet.\*

. Though the land which is intended for woad be never fo good, it must be dunged a year before it is fown with this plant. A crop of wheat may then be taken, after which the ground must be brought into the finest tilth by autumnal plowing, and fummer fallowing in the best manner, as has been before directed.

In warm climates, woad is fown as early as April or May; but in countries like ours, the best way is to give the last plowing towards the end of July or beginning of August, and lay it as fmooth as possible. A good harrowing after this, will fit it completely to receive the feeds, which, if rain falls foon after their being fown, or if they are steeped in water during the night be-

<sup>\*</sup> Bath Soc. Trans. Vol. IV. p. 273.

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fore the fowing, will appear in a fortnight, if the weather be favorable.

They should be but slightly covered, and should be sown so thin, as that the plants may stand six inches asunder. Some strew pigeon's dung on the land just after having sown it with word, and the plants become much the siner for this manure.

It is a common custom to fow woad in broadcoast: but all plants which require being hoed, should certainly be sowed in rows, because this method lessens the labor and time of hoeing; and besides, it is much easier, in this way, to give each plant its due distance.

When the woad is grown large enough to be distinguished, it should be carefully cleared of all weeds, for these would hart it greatly; and at the same time the plants should be thinned wherever they stand too close: without this precaution, the woad would produce but very sew leaves, and would remain extremely stunted in its growth

The intervals between the plants should be stirred whenever the season requires it; and in the doing of this, the weeds will not only be described, but care should also be taken to lay up some earth to the stems of the plants.

It is faid to be the practice in some countries, to flood their woad-grounds; but in order to reap benefit from this, the husbandman should be able to repeat it frequently; otherwise the heat of the sun, after having exhaled the water, would harden the surface of the earth, and thereby greatly injure the plants.

Woad affords two crops in the same season; the first is the best, and is therefore kept separate from the fecond, which would spoil it. The first is fold for from twenty-five to thirty pounds a ton; but the latter will not bring more than seven or eight pounds, and sometimes not fo much. An acre of land well cultivated, will produce a ton of woad, and in good feafons more. The first crop is gathered towards the end of August, and the last at the end of October or beginning of November, but this last crop must be got in before the first frosts come on; for after that the leaves would be good for nothing. When the plant is ripe, which is known by its first leaves beginning to dry, all the leaves are cut off by a man who grasps the plant in handfuls, and they are then laid in a heap to wither. Whilst they are in this fituation, they must be sheltered from the fun and rain, and must be frequently turned in order that they may heat equally : they are then carried to a mill, formewhat like that which is used for preffing the oil out of lin-feed, and are there ground till they are reduced into a paste, which is 11 16 16 11 Z 4 afterwards

afterwards formed into cakes of about a pound weight; and these are laid to dry in a covered place, where neither the rain nor the sun can come at them.

This paste is dried thus for about a fortnight, till it has acquired consistence enough to be formed into small roundish lumps, by means of little wooden moulds, into which it is put for that purpose. As fast as these lumps are taken out of the moulds, they are laid upon wicker hurdles loosely woven, so as not to touch one another, and in such manner that the air may come at every part of them, as is practised in the drying of starch. These lumps become very hard, and in this condition it is that that they are sold. When they are to be used, they must be steeped a long while in water before they can be broken.

The woad thus prepared yields an excellent blue dye, very lasting, and with which all the degrees of this colour may be made; and it is not long fince this plant was preferred to indigo.

When it is intended to fave the feeds of woad, a small portion of the plantation should be allotted for this purpose at the last cutting, and then a part only of the leaves there should be taken from the plants: but it is proper to retrench some of them, because experience has shewn

shewn that the plants on which all their leaves are left, run to feed too foon, and that their feeds in this case, have often been destroyed by the cold of the ensuing spring. Thus woad, being a biennial plant, should not be suffered to feed before the month of August, in its second year.

As this plant is reckoned to be a great impoverisher of the soil, it is natural to conclude, that two crops of it successively ought not to be taken.

### SECTION V. STATE

Il are inclosed ferall brown toberical feeds. These

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### Of WELD, or DYER's WEED.

into that referentially edge benefit is refer in definer.

WELD is used by dyers to give a yellow colour to woollens, silks, cottons, and threads; and in consequence of this, C. Bauhin calls it Luteola berba, salicis folio, p. 100. Linnæus classes it as a species of the reseda, or bastardrocket. Its root, which is composed of a sew ligneous sibres, does not pierce deep: from this root it puts forth leaves about four inches long, and half an inch broad, of a lively green, soft to the touch, and spread circularly near the ground, with some gentle wavings at their edges, not

not obtuse at their points. Its stem which rifes from amid these leaves to the height of three seet, or even more if the soil and culture be very good, often branches out, and is garnished with leaves like those below, though smaller in proportion as they approach the slowers, which grow in long loose spikes at the end of the branches or stems.

These slowers, which appear at the latter end of June, are each of them composed of three small irregular petals of a greenish yellow, to which succeeds a globular berry of the same colour, terminated by three points, and in which are inclosed small brown spherical seeds. These seeds ripen in September. The plant becomes entirely yellow when it is dry, and the whole of it, but especially the berry, is used in dying. The most slender weld, particularly if it inclines to a russet colour, is accounted the best: that which is larger, and of a dull green, is much less esteemed.

This plant grows naturally along the fides of high-ways, upon dry banks, and on old walls in many parts of England, France, Spain, and other countries, where the winters are not severe: but the cultivated fort is far preferable to the wild, both for the quantity and goodness of the colour which it yields. It will thrive tolerably on almost

atmost any soil, provided it be dry and warm: but the richer the land is upon which it is sown, the greater will be the produce; and in proportion to the care with which it is cultivated, the more vigorous and fit for dying will it be.

The ground for this, as for every other plant, should be in fine tilth at the time of fowing it; though here, unless it be very poor indeed, it will not require dung. The feed should be that of the preceding year; for if it be older, great part of it will not grow. It is a bad custom to fow weld broad-cast, or along with any grain: but if it be fown broad-cast, the plants should be fet out with the hoe at fix inches distance at least. It is however far better to fow it in drills; as is the case with all plants that require hoeing. It will only want to be bush-harrowed; for it should not be covered deep. A gallon of feed fowed in the broad-cast way is enough for an acre. It will not grow much the first summer, when thus fown; but it will grow apace after the corn is off.

The beginning or middle of August is a proper season for sowing weld in this country. The only care it requires while growing, is to keep it clear of weeds which might choak it, or at least weaken its growth.

Mr. Miller is of opinion, that the best time to pull the weld for use is, when it begins to flower,

that

that is to fay, about the latter end of June : because, like all other vegetables, it is then in its greatest vigour, and consequently best fitted to yield the greatest quantity of dye. For a produce of new feeds, the best way is to sow a small piece of land on purpose, or to fer apart for this end, a fuitable portion of the field, rather than let the whole fland too long; by which means the useful plants would be injured in their quality, far beyond the value of the feeds got from them; the berries being, as was before observed, the part which yields the finest dye; besides, the seeds obtained from the whole field prematurely pulled; would be a mixture of ripe and unripe feeds, not to be relied on. The common way of drying these plants, is to fet them upright in small handfuls in the field, and when they are dry, to tie them up in bundles. They must be housed dry, and care must be taken to flack them loofely, that there may be room for the air to pass between: to prevent their fermenting. It like a said

The plants intended for feed should be pulled as foon as their feeds are ripe, and then be dried and beaten out for use; for if this be deferred, or if they are let stand too long, the seeds will weaken its growth? I is all list fcatter.

The method of cultivating this plant at Oiffel, office weight of the first where it is then as the self in in Normandy, where great quantities of it are raifed, is as follows:

In the month of July, just after the kidneybeans then in bloom have been hoed for the fecond time, and earthed up, especially if there be any appearance of rain, weld is fown among them, very thin, and as equally as possible. This feed is buried by dragging over it a fmall bush of thorns. Whilst the weld rifes, the beans ripen and are gathered; after which the former occupies the ground entirely. This is hoed about Michaelmas, then left in that condition during winter. and in the ensuing month of March, when the danger of frosts is over, it is hoed again, to extirpate fuch weeds as may have fince come up. Towards the end of June in this fecond year, when the weld has done bloffoming, when its berries form, and when the plant begins to turn vellow, advantage is taken of the first fair day after rain, to pull it up. Two men will then do as much work in a day, as four can do when the ground is hard and dry. It is carried off in large bundles: but these are untied before the weld is laid up for keeping, and the plants are spread out and fet upright against walls or hedges exposed to the fun, the heat of which dries them completely in two days. They, are then laid upon a cloth, to prevent the loss of the feed, which drops easily

out of the now open capfules; and finally, after being tied up again in bundles, weighing about thirty pounds apiece, they are piled up loofely in a barn, or other well covered place, where they complete their ripening, and generally shrink to less than half their former weight.

Weld raifed on rich ground is apt to be greafy, and too full of stalks: that which grows in fandy places is of a better quality, and has only one main stem: but, in return, the produce here is much less than in the former case.

As foon as the weld has been pulled, sheep are turned in upon the land, to eat up the grass it may have produced: it is then plowed once, and after another plowing at the end of October, it is sowed with wheat or rye, without using either compost, or dung. If the land is light, and deftined for spring corn, turnips may be sown upon the first plowing after the weld; for there will be time enough for this crop, before the necessary plowings for a spring crop.

Weld may be fown with peas, in alternate rows, and managed precifely in the fame way as with kidney beans.

Mr. Young informs us, that Mr. Arbuthnot fowed weld on two acres of land that was thinly planted with madder. The weld was pulled in the month of July, in the second year, and yielded

on both acres a produce worth feventy-two pounds, that was fix loads, at twelve pounds per load; which was the price that year. It is true, the madder was not fo good on the land where the weld grew; but both crops together yielded him a clear profit of thirty pounds, four shillings, and two pence per acre\*.

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## Of LAVENDER.

NARROW-LEAVED Lavender is the common fort, and is so well known as to require no farther description. It slowers in July, at which time its spikes are gathered for use: there is a variety of this, with white slowers.

This plant is propagated by cuttings, or slips; the best season for which is in March, when they should be planted in a shady situation, or at least they should be shaded with mats until they take root, after which they may be exposed to the sun; and when they have obtained strength, may be removed to the places where they are designed to

Farmer's Eastern Tour, Vol. II. p. 282.

remain. These plants will abide much longer in a dry, gravelly, or stony soil, in which they will endure our severest winters; though they will grow much faster in the summer, if they are planted upon a rich, light, moist soil, but then they are generally destroyed in winter; nor are the plants half so strong scented, or fit for medicinal uses, as those which grow on the most barren, rocky soil.

Lavender may be cultivated to advantage on a few acres of land that are suitable to it, and at no great distance from a capital town, where there is always a demand for it, by the druggists, chemists, perfumers, soap-boilers, &c.

The gardeners about London, who are generally great œconomists of their land, plant out their lavender at first in close rows, and when it grows bushy, so as to fill the alleys, they then take out every other row, repeating this as often as it may be required from the increase of the plants.

They gather from an acre of land annually about four hundred dozen of bunches, of the fize of a man's grip; which they fell at an average for one shilling and sixpence per dozen, or thirty pounds per acre; but from this the expence of culture and rent of land must be deducted, which are no doubt very considerable. But, if we calculate these and all other charges roundly, at ten pounds per acre, which is surely an ample allowance,

ftill there remains a very handsome profit to the

in reads parts of Fugiand, The feed of this is compronty fold under the title of Durham muf-

This plant requires no manure not bring at I

tard feed . IIV is N'O T'T'S 'E' Z'ies, if not diffine frecies; one with cut, and the other with

entire leaves. The falks rife about two feet high, the leaves are dugle to the leaves are jagged

The Howers are yellow, the pods are

THERE are three forts of this plant cultivated by our gardeners, &c., the first of which is the common white mustard, and is generally raised as a falled herb for winter and spring useboyled bee lastegged mode villaged as a falled

like turnip leaves, and in the other are oblone

Another fort is the common mustard, which is frequently found growing naturally in many parts of England, but is also cultivated in fields for the feed, of which the sauce called mustard is made. This rises with a branching stalk four on five feet high; the lower leaves are large, rough, and very like those of turnips; the upper leaves are smaller and less jagged. The flowers are small, yellow, and grow in spiked clusters at the end of the branches; they have four petals placed in form of a cross, these are succeeded by smooth pods, ending with four cornected. II.

ners. It flowers in June, and the feeds ripen in August.

The third fort grows naturally on arable land in many parts of England. The feed of this is commonly fold under the title of Durham muftard-feed; of this there are two varieties, if not diffinct species; one with cut, and the other with entire leaves. The stalks rise about two feet high, the leaves are rough, and in one they are jagged like turnip leaves, and in the other are oblong and intire. The slowers are yellow, the pods are turgid, angular, and have long beaks. These flower in April and May, and the feeds riper in June.

There is a good deal of multard cultivated in Effex, especially about Coggeshall and Kelvedon: it requires a rather heavy foil, which must be brought inro fine rith. One buthel per acre is fown in March, broad-caft, and the plants are fet out at about ten inches distance, and are bood always twice, and frequently three times. The medium crop is three quarters an acre; and the medium price is ten shillings per bushel; this makes the crop worth about twelve bounds an acre. I have however been affored, that four, and even five quarters are not uncommon; and am convinced, that if the horse-hoe was adopted in the culture of this plant, the produce would DEFE. II . feldom

feldom or never fall short of that quantity: for nothing improves the seeding of plants half so much as the proper use of that implement, which brings an aid at the very time when it is most wanted.

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Of the Culture of Artificial Graffes.

## SECTION I.

#### Of LUCERNE.

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E IGHT species of this plant are distinguished by Mr. Miller: but J. Bauhin's Medica major, erectior, storibus purpurascentibus, greater upright medic, with purplish slowers, is that which is cultivated for the food of cattle, and in all probability the Medica of Virgil, Columella, Palladius, and other ancient writers on husbandry. It has a perennial root, and an annual stalk, which rises full three seet high in good land, and is garnished at each joint with trisoliate leaves, whose tubes are spear shaped, about an inch and a half long, and half an inch broad, sawed

fawed towards their stalks. The flowers grow in spikes, which are from two, to near three inches in length, standing upon naked soot stalks, two inches long, rising from the wings of the stalks: they are of the pea bloom, or butterfly kind; of a fine purple colour, and are succeeded by compressed moon-shaped pods, which contain several kidney-shaped seeds. It slowers in June, and its seeds ripen in September.

There are different varieties of this species, viz. one with violet coloured flowers; another, with yellow flowers; a third, with yellow and violet flowers mixed; and a fourth with variegated flowers; but none are so strong or good as that with purple flowers.

Columella calls this the choicest of all sodder, because it will last ten years, and will bear being cut down sour, and in some seasons six times in the year; because it enriches the land on which it grows, sattens the cattle sed with it, is a cure for sickly cattle; and because a jugerum (about three quarters of an acre) of it is abundantly sufficient to seed three horses through the whole year.

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<sup>\*</sup> We shall find that it will last much longer: Pliny, indeed, says thirty years. This, however, it will not do in our climate, nor will it cut six times in a season as in Italy.

SPIT Y

This plant is supposed to have taken its name Medica, from Media, of which country it is said, to be a native, and that Darius Hystaspes carried great quantities of it from thence, as provender for his horses, when he invaded Greece; by which means its seeds became scattered there. Whether the Romans first had it from that country, or from Media, I will not pretend to say; but certain it is, they held it in very great esteem.

Yet, notwithstanding it was in such high repute with the ancients, and has been cultivated to great advantage for many years, both in France and Switzerland, it was not till very lately that it has been much in vogue here, although it succeeds as well in this country, as in either of the last mentioned; being extremely hardy, and resisting the severest cold of our climate.

As I cannot too much recommend the culture of this admirable plant, I will here give fuch practical information, as I hope will tend to promote it; and for this purpose I will first lay before my reader, that authentic account which I find given by Mr. Arbuthnot, as related by Mr. Young, in his Eastern Tour.\*

In the year 1759, twelve acres of a black, deep,

value all varieties of Vol. II. p. 257. rel 1 a may still aver

A the advice some as a secret as use is fandy

fandy loam were fown with barley, after turnips, and with it ten pounds per acre of lucerne, broadcast. The corn was mown and carried; but nothing done to the lucerne.

In 1760, it was mown for foiling horses, &c. but the produce was weak, and not considerable enough for a particular valuation.

In 1761, the crop came to perfection. Early in the spring, it was cross plowed with a round share, and harrowed. Mowed it thrice, each time for hay; the product of the three crops was four tons per acre of the best hay ever used. The team-men would not at first use it; but they were at last so prejudiced in its savor, that when done, they lamented the loss.

After the mowing there was an aftermath, which yielded fome food for cows and sheep. Between each cutting it was harrowed: and likewise in Autumn. The average price of common hay is forty-five shillings a load; but Mr. Arbuthnot valued this at sifty-five shillings; in which valuation his men agreed.

In 1762, The culture was the same as the preceding, and also the crop; it was again mown thrice.

In 1763, The same culture and product: a lattermath at the end of September was cut off in one nightby a slight frost: for, hardy as the plant

Aa4

Three

in general is, yet the shoots are extremely tender; they will bear no frost. The natural grass made so formidable an appearance, that the autumnal harrowing was omitted; from an idea that it would be ineffectual.

In 1764, One acre was plowed up in the fpring, and planted with madder; the eleven remaining were mown twice, but had no harrowing: the product forty-four tons of dry hay; but more than half was in the first crop, and much of it natural grafs.

In 1765, Plowed the whole up in the fpring, for madder: the lucerne declined, owing, as apprehended, to a want of more regular and severe harrowing; as it has been found, that the severest operation of that fort will not damage the plants. Rocque's harrow was used.

With respect to making it into hay; the lucerne is so stalky, that it does not settle soon; it was therefore stacked very green. The heat that results from sap (not wet) is beneficial. It was always cut as soon as there appeared a general scattered bloom.

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mi /		1 51	Vii.		Three

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Three harrowings		4 6
Three harrowings		5 0
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1763. By four loads of hay, at fifty-
Expences this year 2 16 6
Clear profit £ 8 3 6
1764. By four loads of hay
Clear profit £ 8 14 6
The above four years profit collected, is
Which is fix pounds four shillings and four

Which is fix pounds four shillings and four pence per annum, and on twelve acres, seventyfour pounds twelve shillings.

This proves the great profit of lucerne: and had it been cultivated in drills, instead of being fowed broad-cast, it might have continued from fifteen to twenty years in the ground, in an equal state of perfection and of produce. It is true, there are some objections to the drill culture of this grass: such for instance, as its not covering the ground so as to have a proper swerd or bed, for the making it into hay when cut; again, this operation preventing for a time the growth of the

the plants, which would otherwise vegetate rapidly: but this last objection, equally affects the broad-cast and the drill-sowed lucerne; and I am of opinion both difficulties may be removed by a simple contrivance.

Every farmer has a stock of hurdles by him. not much in use at this season of the year: let him fix them up in rows between the fwarths of lucerne, so as to make one row to every two fwarths. Instead then of beginning to move and turn these swarths upon the bare ground, and the tops of the growing plants; let the farmer employ his hay-makers, men, women, and children, to take up the swarths in heaps with both hands, and hang them well poifed over the hurdles, where they will be exposed to the fun and air, and free from the damp of the ground, and will confequently be more made in one day in this fituation, than in three, while on the ground: But this is not the only advantage attending this mode of management: for in this way, the hay will be fo little moved and toffed and tumbled. that neither the leaves nor flowers, which are the most precious parts of the plant, will be disturbed or shaken off; and the favings of those, and of the labor of frequent turning, &cc. I am convinced would fully compensate the expence of hurdling and hanging up the grass; particularly

if it be confidered, that in this way there can be no mixture of earth or dirt to daub and foul the hav. This circumstance is the reason why Mr. Arbuthnot has recommended the broad-cast culture of this plant, in preference to the drill-fowing: but if this objection were obviated, he clearly and decidedly recommends the drilling in rows eighteen inches afunder: and at all events prefers this method when the lucerne is to be cut for foiling of horses; it not being, in this case, subject to the inconvenience of wet and dirt. &c.

I can see no objection to this hurdle plan, but its being exposed to high winds, which might throw it off. This may happen; but it must be carefully replaced, when the wind falls; and this may still be executed at less expence than the constant labor of tumbling it about. Where this grafs, or indeed any other, is referved for feed. I am fure this is infinitely the best way of proceeding, to have it in good condition.

If lucerne be drill-fowed, Mr. Cooke's new invented hoe is, for it, an admirable and œconomical contrivance, and will keep it in excellent condition with little trouble, compared to any other method; for that hoe will clear all the alleys of their weeds better than any shim, and at the fame time will stir the ground to a proper The district of the grant of the name of the grant of

depth. This hoeing flould be repeated after every cutting of the grass.

But if the broad-cast method should still be preferred by some farmers, they will find it absolutely necessary to harrow and cross harrow it both in spring and autumn, till the land has altogether the appearance of a fallow; and also to manure it every autumn, before the harrowing, with sine rotten compositions.

The spring harrowing should be done as early as the season will admit; but if even the young shoots are begun to spring, still it must be harrowed, for they had better be totally destroyed, than omit an operation so essential to the goodness of the crop.

In order to afcertain in what degree lucerne would bear rough treatment. Mr. Arbuthnot wounded many plants severely, and even mangled them. Others he cut off three inches below the ground: these last were absolutely killed; but the former were not apparently hurt. This fact proves, that the buttor crown may be wounded in any degree; for if the least bit remains, it sprouts presently; but if quite cut off the plant is destroyed.

I shall next lay before my reader an account of the culture of lucerne given to the Society of Arts Arts in London, by Mr. Pratt of Purfleet, in Effex.\*

The field where the lucerne was cultivated, was a good hazle loam, neither too light nor too fliff, the foil about three feet deep, with a chalky bottom, the land inclining to the north-east: some part of the same field was suffer, inclining to a clay; but not fore whether any chalk lay under this part, though the plants showed no difference from the difference of foil.

The field in 1773, had borne turnips properly hoed and fed off with fheep; and on April 13th, 1774, after the land had had two plowings and harrowings, the ground being fine, he began to fow in drills twenty inches afunder, and used about fix pounds of feed per acre.

In May and June the fly made great havock, fo that at different times the flowing and hoeing were repeated until the 5th of July, when the rows were complete, and those parts that were not damaged by the fly, were in a thriving state; on the 30th of July began to cut, and by the 20th of September, it had been cut all over once. The latter end of October, ten loads of rotten dung were laid on each acre, and, the earth was turned each way out of the alleys, and laid over

<sup>\*</sup> Lond. Soc. Trans. Vol. I. p. 164.

the plants, with a small plough; so that the land appeared like a fallow.

bruary this year, when it was bush-harrowed cross ways, to lay the ridges down into the alleys.

In April, mended some trisling places, and in May 27th began to cut, it being then about twenty inches high.

June the goth, began to cut the fecond time, and followed this cutting with a horfe-hoeing in the alleys, and a hand-weeding in the rows.

August 7th, began to cutlthe third time it alecon

September 26th, began to cut the fourth time.

November 6th, dunged and plowed as last year.

1776. The weather being wer, could not bushharrow until the 12th of March, and on the 27th,
as the plants grew fast, gave it a perfect handweeding in the rows. Began cutting in May,
and during this summer out four crops, horsehoeing the alleys each time of cutting; handweeded again in September, and in November
dunged and plowed the alleys as last year.

In May this year, Mr. Pratt fowed two acres more, adjoining to the above, which had borne cabbages the preceding winter, and were taken off before Christmas, and the land then plowed and prepared for fowing.

The plants came up well, and no accident hap-

pened from the fly cut this fowing once this year, and cultivated it like the other lucerne.

The produce of these four acres maintained ten horses twenty-eight weeks, or seven months, and fifteen head of cattle eighteen days.

The land which bore the cabbages was preferable to that which bore turnips; being much cleaner. May is a proper month for fowing; hand-hoeing and weeding are requifite the first years as the plants are too tender for the horsehoe. Cutting once only the first year, gives the roots time to shoot down, and gather strength.

Horse-hoeing the alleys after every cutting, and hand weeding the rows in March or April, are necessary; but before it is laid up for the winter; should not on any account be omitted. After the last cutting and weeding, let ten or twelve loads of rotten dung be laid on each acre, and gathered up with a small plough, to form the ridges over the crowns of the roots; nothing more is necessary until the first dry day in February; then bush-harrow the ridges down into the alleys.

their perfection, and do not appear to improve or diminish after that time: neither does dry or wet weather materially affect their growth; as Mr. Prair frequently observed by tying a silk banes.

thread round some plants. It grows about an inch a day, or somewhat less if the weather be cold.

This grass has the effect of falt-marshes; it purges and is disretick for three or four days, and then fattens horses at a great rate, although hardly half the allowance of corn is given.

Sheep should not be permitted to bait on it; as they will scoop the crowns of the roots, and destroy those buds that are formed round the crowns for the succeeding crop; but that is not the case with horned cattle.

It is observable, that Mr Arbuthnot's direction is quite the reverse, in this respect; for he recommends the aftermath as excellent feed for sheep.

We have now feen the methods of fowing lucerne broad-cast and in drills: but there remains yet another way of cultivating this grass, by transplanting; which I have practised with success, and think it is attended with some advantages over either of the former ways: for in this case, when a field is planted out from the seed-bed, it is sooner productive, and is free from the devastations of infects: but, besides this, it is attended with what I reckon a still greater advantage, which is, the cutting of the tap-root and making it branch out laterally; which in shallow soils is of real benefit.

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I was much flattered when I found my system was agreeable to that of M. de Chateauvieux, who explains it in this manner. Lucerne grows naturally with one large perpendicular or tap-root, which penetrates very deep into the earth, and has sew, if any, lateral roots. From similar experiments on other tap-rooted plants, he was induced to think, that lucerne, by transplanting it, and at the same time cutting off part of its tap-root, might be made to shoot out horizontal roots, which, reaching into the loose mould of the alleys, and extending themselves there, would collect a greater quantity of nourishment for the plant, and consequently enable it to produce more abundantly.

M. de Chateauvicux's experience justified this idea in its fullest extent, and the horizontal roots pushing out, were again cut off by the horse-hoeings of the alleys, which made them branch out afrest, and thus multiplied the roots and sibres amazingly. His rules for transplanting are to this effect.

round, and as the lucerne is to remain many years on the ground, no pains should be spared in preparing the earth.

in a rich mould that the plants may be firong enough to transplant in September.

3. Plants

3. Plants two or three years old my be transplanted, as well as young ones.

4. They should be transplanted in August or September, that they may have time to take fresh root before winter comes on.

5. The mould into which they are transplanted should be moist; and if the weather be somewhat rainy it is the better. In this case, watering the plants is quite unnecessary.

6. If the autumn be very dry, it is better to flay till the following spring; and if the plants are moved in April, they will surely take root and do well.

7. If they can be transplanted in autumn, they will yield pretty good crops the next year: but if they are not moved till spring, the crop that year will be but indifferent.

8. The plants from the nursery must be taken up with care. The roots should be left fix or seven inches long, and the green tops cut off within two inches of the crown.

9. The plants will take root sooner, if put into water when taken up, and kept there till planted.

a better way is to open a straight surrow five or fix inches deep, and placing the plants therein, cover them up to the neck.

- any weeds to grow among the lucerne. To this end, the rows should be weeded by hand, where the horse-hoe cannot go.
  - as repeatedly directed for other plants. Or Mr. Cooke's horse-hoe may be used, as I have before mentioned.
- 13. This hoeing should be repeated after every cutting, and the plants earthed up in winter as Mr. Pratt directs.
- 14. As foon as fome of the plants begin to bloffom, the lucerne should be cut. It will then make excellent fodder, superior to every other kind. It should be dried as quick as possible, and frequently turned.
- 15. It must not be housed till it is dry: but it is possible to over-dry it, and then the leaves will drop off, which should be avoided.
- once, till they are accustomed to it.

These rules contain all that is essentially necesfary for cultivating properly, this kind of artistcial pasture; and sainfoin may be managed exactly in the same manner.

M. de Chateauvieux informs us, that he had upwards of fix loads on an English acre in one year, by this mode of culture, which is two loads more than

than Mr. Arbuthnot's produce; and at his price . of fifty-five shillings per load, would make the annual value of the crop amount to fixteen pounds ten shillings: and supposing the culture and harvelting in the drill way to amount to fix pounds ten shillings, which is double what Mr. Arbuthnot calculates, still the neat profit would be ten pounds on this crop; which is immense. Mr. Recques who cultivated this plant at Walham-Green, has feen it mowed five times a year, when it produced eight loads of hay per acre, which goes yet beyond M. de Chateauvieux, and makes if the most profitable crop that can be cultivated; particularly when we consider how far superior this grafs is to every other fodder for the feeding of cattle? as I shall have occasion to state preof one root being more than that of any search

In the year 1781, a gentleman farmer of this county made an experiment upon the culture of lucerne, by dividing a field of eight acres into four parts, which he fowed in the following manner:

First part in drills, three feet afunder.

Second part in drills, two feet afunder.

Third part in drills, one foot afunder.

Pourh pan, broadlean, ath nameling wife.

The foil was equal throughout the field. The feed was fown the 24th of April; on the 16th of B b 3 August

August the whole field was cut, and the produce, of each part weighed separately.

That fown in three feet drills produced only about half the weight of that fown broad-caft, and the rest in proportion, lessening as the width of the rows increased. This at first disconcerted the gentleman, who had been made to believe he would have most from his three feet drills. He was however perfuaded, by an intelligent friend, to give the whole a fair trial for three years, which he did, and found that the second year, the difference was greatly in favour of the three feet drills; and in the fourth year they had a very decided superiority; for by this time the plants became much ftronger, fpread amazingly, and nearly filled up the spaces between them : the produce of one root being more than that of any ten in the broad-cast n which, by standing too close, were impoverished, and could not increase in bulk like the others, blad a guilbivib yd garrand

feet drills was more than double the broad-cast, and admitting the horse-hoe, were kept free from weeds and earthed up at a small expense, compared to the others.

This gentleman adds, that transplanted lucerne produces very little the first year, but in the se-

by Alle

cond is generally as good as that of three years growth from the feed.

Weeds are the greatest enemy to lucerne; and the easiest and cheapest way to keep the crop clean is, by fowing in drills fufficiently wide to admit the horse-hoe; which not only destroys them at the least possible expence, but greatly promotes the growth of the plants by earthing them: and. he might have added, by cutting their roots, and making them push out fresh fibres. It on however

As a complete proof of this advantage, M. de Chateauvieux informs us, that having taken up force transplanted lucerne, where the tap-root was cut; he found feveral large roots had grown out laterally, which being again out by the horfehoe, would no doubt fend out fresh fibres, and Yelld greatly to firengthen the plants. He ho must

- He fed his horfes with lucerne in the furning when they do most work, and was sensible of the great advantage sie had loves other fodder. He fays, that five or vine printed anday are fufficient for a middle fixed horser but the quantity may be increased or diminished, according on the horses ore venes, the lucernes from hearingd bed swoin offer While Chareauticux oblerves, that old fets may be transplanted as well as young roots; and with

and the state of t - STYD C TO Bath Son Trant Vol. II. B. 1017

as good fuccess. He also says, that he did not manure his lucerne, but trusted altogether to his horse-hoe for culture. In this I think he was wrong: for I would certainly recommend a proper dressing every second or third year.

M. du Hamel informs us, that if lucerne be much wet in the field after it has been mowed, its leaves will turn as white as paper in a few days; but if it is only a flying shower, which has penetrated no farther than the furface, the best way is not to touch the swarths till the wind has dried them. In very hot weather, this hay must be housed before it is quite dry s' or the greatest part of its leaves will fall off. He is of opinion, that it cannot be kept long in flacks in the open sir, unless those stacks be very well thatched, so as to turn off all wers he allo steemmends a chimney to let off the imoift and flagrant air, as we pracvife with during and what, and clover, &t. mil of Burnblittinks it a still preferable way to house this hay, and if this is done when it is full aslifelevelamej her pecommends putting it alternately with layers sof fittawoon The fitraw, thus placed, prevents the lucerne from heating; and contracts a fine fixed finell, fo pleafing to horses, that they dat it with appetite when given to them in the winter, mixed with the lucerne.

M. du Hamel affures us from his own expe-

rience, that this fodder cut before it had bloffomed, and given green, had restored young horses
which had fallen away and lost their slesh, when
no cause could be assigned for their decay, and
that cows sed with it yield an extraordinary quantity of excellent milk. He holds it to be admirable food for every kind of cattle, horses, oxen,
cows, and sheep, all of which are fond of it either green or dry.

rishing when dry, and that cattle, if let alone, will eat of it till they swell, or are hoved. But this is easily prevented by stinting them to a proper allowance, with which they will fatten and grow strong.

M. du Hamel has farther remarked, that in fome years fwarms of black caterpillars are apt to breed in lucerne, and to eat up all its young (hoots to prevent which mischief, he advices to cut it down as foon as these enemies begin to appear a for they will be thus destroyed, and the plants will soon shoot out anew, generally without any damage to the ensuing crop.

o Mr. Baker, of the Dublin Society, wholeness curacy may be depended upon, has given us fome very interesting, experimental trials respecting the value of success completed to that of turn nips and cubbages: which are as follow.

ung.

A fattening bullock of four cwt. will confume

Of turnips 2 cwt, or 1/2 his beef weight and fome hay? The bonder of blace thereon

Of cabbages 1½ cwt. or 3 of ditto, and ditto.

A bullock may be supposed to be well fattened on turnips, cabbages, or lucerne, in twenty weeks, thus.

Definition at 2 cwt. a day (besides 81 cwt. of hay) at 4 tons. Although the war with many and the

Of cabbages 11 cwt. a day (and 81 of ditto)

of lucerne at \( \frac{3}{4} \) cwt. a day (no hay necessary)
5 tons 5 cwt.

An acre of each of these will fatten, I al 1/1

Turnips, at 25 tons, will fatten (with hay) near

near a dittol same slads a nool se much bay)

next seditto: 10 to wans two toods nool liew annual

All which plainly shew the superiority of his cerne to the other two plants seither by weight or by theighter is not believed as your variety

As far as my own experience goes, which has only been on a fmall feale, I should be inclined to recommend the culture of lucerne by transplanting,

ing, rather than by feeds: it is both the quickest and the most certain, as being most secure from insect foes. Nothing can exceed the excellence of this hay for cutting into chass; it goes a great way to save corn, and if cut along with the straw, with which it has been housed as above mentioned, its will much improve the straw for this wery useful purpose.

# the progress of its roots. On the contrary, the deeper the Hth N, O. I. To D. B. Roots extends and the stronger and more describing is the

depth, a bed of gravel, flone, or chalk, to floo

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THE French call this plant fainfoin; which fignifies wholesome hay; because it agrees remarkably well with all forts of cattle. As we owe to the French our first knowledge of this grass, we have adopted their name for it; but its botanical appellation is Onobrychis.

If fainfoin is cultivated in drills and horfehoed, its stalks will grow five feet long; and according to Mr. Tull, one acre of it will yield as much grass, as thirty or forty acres of common pasture.

\*Herfe-hoeing Husbandry, chap. 12 pm 11 1211

This great productiveness of sainsoin, is owing to the vast quantity of its roots. Its tap-root penetrates sometimes to fifteen or twenty feet deep, and sends forth many lateral branches, which extend a great way, especially towards the surface of a good soil.

It is wrong to think, as many do, that fainfoin will not succeed, if there is not, at a certain depth, a bed of gravel, stone, or chalk, to stop the progress of its roots. On the contrary, the deeper the earth is, the more its roots extend, and the stronger and more flourishing is the plant.

As some of its seeds will not always grow, a small quantity should be first sown to try it; as has been directed with regard to other plants.

Sainfoin should not be fown above half an inch deep; especially in stiff lands: for the heads of its seeds are so large, and their necks so weak, that if they lie much deeper, they are not able to rise through the incumbent mould.

As this plant yields but an inconfiderable produce the first year, the farmer, in order to make the more of his land, often sows it along with barley, oats, clover, &c. The barley and oats remaining but a short time on the ground, do no great injury: but clover and other biennial plants hurt it much!

It frequently happens, in dry years, that no fainfoin is feen when the barley or oats are mowed; but on examining nearly, white threads may generally be perceived, which show that the fainfoin has sprouted, and that its leaves, then very small, have been cut off by the scythe.

If the other feeds fown with the fainfoin come up thick, and grow apace; and especially if they are lodged, the fainfoin is generally choaked. But this never happens when it is sown with the drill plough: for as it is then in rows by itself, it is in little danger of being overpowered by other plants; and sowed thus in alternate rows, it might answer extremely well; for it would have air and sun furficient, and not too much heat; and at the same time a season would be saved in its growth.

When Mr. Tull began to cultivate fainfoin with the horfe-hoe, he fowed two gallons of feed to an acre; and almost all the feed of an acre or two of ground perished, from its being fown too late. But he was agreeably surprized at the end of three years, to see some plants of this grass of an extraordinary size dispersed here and there. This part of the field yielded him double the quantity of grass that the rest did, where the seeds had not perished, and where the plants were infinitely too close.

He concludes from thence, that it is most pro-

fitable to fow fainfoin thin, that the roots of one plant may not hurt those of another: and he thinks that they deceive themselves who sow their sainfoin very thick in hopes of reaping a more plentiful crop; because by so doing, they reduce their sainfoin to the condition it is in on the hills of Calabria, near Croto, where it grows naturally without any culture, but so low and stunted, that one would almost wonder what could induce any one to cultivate so unpromising a plant.

Mr. Tull draws these conclusions from his experiments.

1. When fainfoin is fown with a design to cultivate it with the horse-hoe, the best way is to sow it in two parallel rows, eight inches distant from each other, and to make the alleys forty inches wide, so that from the middle of one surrow to the middle of another, will be sour feet.

2. If fainfoin be fown with an intention only to hand-hoe it, the space between the two rows should be fixteen inches, and the plants in the rows should be at least eight inches a sunder.

3. When fainfoin is fown without any defign to hoe it, the best way is to drill the rows eight inches asunder, with no greater quantity of seed, than when they are sixteen inches distance: for each plant ought to have sufficient space around it, to extend its roots in, and draw its necessary notifishment

nourishment from, without hurting its neighbour-

Sainfoin thrives best in a rich, dry, and light foil, especially if there be a bed of lime-stone, chalk, or gravel, under a confiderable depth of mould. In marshy grounds, or in lands which retain water, the roots are chilled, and the plant foon perishes. Though it is a strong plant, the ground on which it is fowed ought to be in very fine tilth: for as it shoots out a great number of roots the moment it fprouts, the mould ought to be as loofe and thestaple as deep as possible. It may be fown at any time: but if fo late as autumn, the young plants will be in danger of being hurt by frosts: and if it be fown in fummer, the feed frequently remains long in the earth without fprouting, or if it rifes, the drought usually flunts the young plants. The fpring is therefore the most proper season for sowing it, when there is no longer any danger of hard frosts.

By means of the drill plough, the feed of the fainfoin is dropt into channels which this implement makes, and is at the fame time covered with the proper depth of earth.

If sainsoin be drill-sowed, a distance of twenty inches or two feet between the rows is the least that should be given, and the seeds should be distributed very thinly. The alleys may then be com-

pletely

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pletely ftirred and cleaned by Mr. Cooke's fix shared horse-hoe: but this will only be necessary once, or at most twice, in the year, to this plant: that is, in fpring and autumn. Thus the expence will be but trifling, and the fainfoin may last thirty years on the same ground, which by this frequent stirring, will be kept perfectly clean and in good heart. a high should be such seen nool.

Sainfoin deferves the farmer's utmost attention as one of the most profitable plants he can cultivate. It will do on almost any land; and though it fucceeds best on fuch as I have mentioned above, yet it will grow even on dry barren spots, where fearcely any other grafs can live; provided its roots be not chilled by a cold clay, or other fubstance which retains water; and it has this farther advantage, that it may be moved at different degrees of ripenels, with nearly the fame the trade proper states for ferrings with the states

1. It may be moved before it is in bloom. for it is then admirable food for horned carrieand when cut thus early, it yields a fecond crop, which makes ample amends for what was loft, by not letting the first come to its full growth-This early cutting is likewife attended with another benefit, which is, that it purges cattle, in the beginning of the fummer, and thereby frees them constraint the second of Design to from

from diforders occasioned by the winter's cold or dry food.

be left standing till it is in bloom; when it still is excellent sodder for cows. But care must be taken in making it into hay, that the slowers do not drop off, as they are very apt to do: for cattle are so sond of these slowers, that they often induce them to eat the rest of the plant.

3. If the rain continues, the fainfoin may be left flanding till some of its seeds are formed, and the crop will then be more plentiful; nor only because it will have attained its full growth, but likewise because its leaves, being more substantial, diminish less in drying. It is not indeed then quite so sweet as before; but horses eat it readily, because they love to feel between their teeth the seeds which now begin to be formed.

Mr. Tull fays, this fodder is fo excellent, that horses need no oats when they are sed with it. He affirms, that he kept a team of horses with it a whole year in good plight, without giving them any oats, though they were worked hard all-the time. He adds, that he sattened sheep with it, in test time than others that were sed with corn. But the hay of this plant can never be so good as when it is cultivated with the horse-hoe: for in

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the common broad-cast culture, it blossoms almost as soon as it is out of the ground.

If the season continues rainy, it may be more adviseable to let the sainsoin remain standing, than to run the hazard of having it rot on the ground; for then the seed will ripen and nearly make up for the loss of the fodder: not only because it will setch a good price, but also because two bushels of it will go as far in seeding of horses, as three bushels of oats; and cattle in general, as well as poultry, are extremely fond of it.

The first of these sorts of sainsoin hay, cut before the bloom, is Mr. Tull's virgin hay, which,
he says, is the best beyond comparison, and has
not its equal in the world, except lucerne. He
gives the next place to the second sort, cut whilst
in bloom; and says, that an acre of land, well
cultivated, may yield three tons of this blossomed
hay: and he esteems the third sort, which he calls
the full grown, many degrees inferior to either of
the sormer; though it yields a greater crop, because it has grown to its sull bulk, and shrinks
but little in drying. Even the sainsoin haulm,
after having yielded its seed, will make extremely
good winter food for horses and large cattle, when
other fodder is scarce, and is reckoned better

than the coarse hay of flowed meadows, or any kind of straw.

M. du Hamel has favored us with the following directions for making fainfoin hay.

In a day or two after the fainfoin has been mowed, it will be dry on the upper fide, if the weather be good. The fwarths should then be turned; not fingly, but two and two together: for by thus turning them in pairs, double the space of ground is left betwixt pair and pair, and this needs but one raking; whereas, if the swarths are turned singly, that is, all the same way, the ground would require as much raking again.

As foon as both fides of the swarths are a little dry, they should be made up into small cocks, the same day they are turned if possible: for when the sainfoin is in cock, a less part will be exposed to the injuries of the weather. The wet and sun by turns, would exhaust almost all its juices in fix or eight days.

These little coeks of sainsoin may be safely made into large ones, without waiting for their being so thoroughly dry as those of common hay ought to be: because common hay, by sinking down closer, excludes the air necessary for keeping it sweet; so that if the weather prevents its being frequently stirred and opened, it will heat, turn yellow, and be spoilt; whereas sainsoin, by

admitting the air more freely, from its stalks being less flexible, will remain much longer without any danger of heating.

Sainfoin hay is never better than when it has been dried by the wind only, without the affiftance of the fun. A little rain, or a mift, which will turn common hay, clover, and even lucerne, black; will do no hurt to fainfoin, which is not really spoilt, till it rots upon the field.

If the weather threatens rain, and the fainfoin is not yet dry, it may be laid in cocks, without fear of its heating, provided a bushy faggot be fet up in the middle of each cock, where it will ferve for a chimney or vent-hole, through which the moisture of the hay will transpire.

As foon as all danger of its heating is over, these cocks should be made into ricks, and thatched. That which is laid up quite dry, will cut out of the rick perfectly green; but that which is heated much in the rick, will become brown; as is also the case with meadow-hay.

It requires some experience, to know at what degree of ripeness it is best to cut the seeded sainfoin; because all its seeds do not ripen at the same time. Some ears blossom before others; every ear begins blossoming at its lower part, and continues to blow gradually upward, for many days; so that before the slower is gone off at the top,

the feeds are almost filled at the bottom. By these means, if the cutting be deserred till the top seeds are quite ripe, the lower, which are the best, would shed and be lost. The best time therefore to cut it is, when the greatest part of the seed is well filled, the first blown ripe, and the last blown beginning to be full.

The unripe feeds will ripen after cutting, and be, in all respects, as good as those that were ripe before. Some, for want of observing this, have suffered their fainsoin feed to stand till all of it has shed and been lost in cutting.

Sainfoin should never be cut in the heat of the day, while the sun shines out; for then much even of the unripe feed will shed in mowing. The right time for this work is the morning or evening, when the dew has rendered the plants supple.

If the weather be fine and clear, the fainfoin will foon dry sufficiently in the swarths, without turning them: but if any rain has fallen, and there is a necessity for turning them, it should be done very gently, while they are moist, and not two swarths together, as in the sainfoin hay before it seeds. If the swarths are turned with the handle of the rake, it is best to raise up the ear-sides first, and let the stub-side rest on the ground in turning: but if it is done with the teeth of the

rake, let the stub-side be listed up, and the ears tested on the earth.

If, however, it be convenient, there is no way of managing this feeded fainfoin hay so good, as that I have mentioned for the lucerne, by hanging it over hurdles fixed in rows, on the field.

If fainfoin be cocked at all, the fooner it is done, the better; because, if the swarths are dry, much of the seed will be lost in separating them; the ears being entangled together. When moist, the seed sticks fast in the ear; but when dry, it drops out with the least touch or shaking.

There are two ways of threshing it: the one in the field, the other in the barn. The first cannot be done, but in very fine weather, and while the sun shines in the middle of the day. The best manner of performing this, is what was before described for the threshing of cole-seed. The seed is then riddled through a large sieve, to separate it from the chaff and broken stalks; after which it is put into sacks and carried into the barn to be winnowed. Care should be taken, not to let the haulm or straw get wet; for it would then be spoilt.

A very important, and at the same time a very difficult article is, the keeping of the seed that has been threshed in the sield, without having ever been wetted. If it be winnowed immediately,

ately, and only a little laid in a great heap, or put into a fack, it will ferment to fuch a degree in a few days, that the greatest part of it will lose its vegetative quality. During that fermentation. it will be very hot and fmell four. Spreading it upon a barn-floor, though but seven or eight inches thick, will answer no end, unless it be frequently and regularly turned both day and night, till the heating is over: but even this will not make its colour keep fo bright, as that which is well housed, well dried, and threshed in the winter. But if well got in, and laid up unthreshed, it will keep without any danger of spoiling, because it does not lie close enough to heat. The best way to preserve the seed threshed in the field, is to put a layer of straw upon a barn-floor, and upon that a thin layer of feed, then another layer of straw. and another layer of feed, and fo on alternately. Thus the feed mixing with the straw, will be kept cool, and come out in the fpring of as green a colour as it was put in.

The greatest part of sainsoin that is sown, is spoiled by being indiscreetly sed by cattle. Mr. Tull is against feeding it during the first or second year, or in the spring of any other year. He says, he has recovered worn-out pieces of sainsoin, by plowing them in alleys three seet wide, and leaving beds of sainsoin of the same

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breadth

breadth between them. The plants, by extending their roots in these new plowed alleys, have recovered their vigor, and yielded good crops of hay. He adds, that sainsoin is observed to enrich whatever ground it is planted on, even though a crop be taken off it yearly. This must either be from the nature of the culture employed, or by the great exudation from its roots.

I have already observed from M. de Chateauvieux's authority, that the rules and directions given for the transplanting of successes will answer equally well for the transplanting of sainfoin. And it may also be observed, that, like successes, it is admirable for cutting into chaff for horses, and is much used for this purpose by the stablekeepers in London, in order to save corn-

This excellent grass is much cultivated in the neighbourhood of Saffron Walden, in Essex; and they find it there the best and most profitable of any that they raise. As the roots strike deep in their chalky soil, this plant is not liable to be so much injured by drought as other grasses are, whose sibres shoot horizontally, and lie near the surface. They are there of opinion, that the quantity of hay produced is greater, and the quality better, than any other; and that there is one advantage attending this grass which renders it far superior to others, which is, its excellence

for feeding of milch-cows. The prodigious increase of milk which it makes is astonishing; being near double what is produced by any other green food. The milk is also better, and yields more cream than any other,\* and of course the butter will be better coloured and higher slavored. Many cows have been known to give twelve pints of milk at a meal, and that twice a day, when sed on sainsoin.

Sainfoin will always fucceed well where the roots run deep: the worst soil for it is, where there is a bed of cold wet clay, which the tender sibres cannot penetrate. This plant will make a greater increase of produce, by at least thirty times, than common grass or turs, on poor land. Where it meets with chalk, or stone, it will extend its roots through the cracks or chinks, to a very great depth, in search of nourishment. The dryness is of more consequence than the richness of land, for sainsoin; although land that is both dry and rich, will always produce the largest crops.

It is most commonly sowed broad-cast, but is found to answer best in drills, especially if the land be made fine by repeated plowing, harrowing, and rolling. Much depends on the depth

<sup>\*</sup> Bath Soc. Tranf. Vol. I. p. 167.

this feed is fown. If it be buried more than an inch deep, it will feldom grow; and if left uncovered, it will push out its roots above ground, and these will be killed by the air. March, and the beginning of April, are the best seasons for sowing it; as the severity of the winter, and the drought of summer, are equally unfavorable to the young plants. A bushel of seed sown broadcast, or half that quantity in drills, if good, is sufficient for an acre. The drills should be thirty inches apart, to admit of horse-hoeing between them. Much however depends on the goodness of the seed, which may be judged of by the following marks.

The hulk being of a bright colour, the kernel plump, of a grey or blueish colour without, and if cut across, greenish and fresh withinside: if it be thin, surrowed, and of a yellowish cast, it will seldom grow. When the plants stand single, and have room to spread, they produce the greatest quantity of herbage, and the seed ripens best. But farmers in general, from a mistaken notion, that all that appears to be waste ground is unprofitable, plant them so close, that they choak and impoverish each other, and often die in a sew years. Single plants run deepest, and draw most nourishment; they are also easiest kept free from weeds. A single plant will often produce half a pound

pound of hay when dry. On rich land, this plant will yield two good crops in a year: but if the plants do not stand too thick, they will increase in fize prodigiously the second year.

No cattle should be turned on the field the first winter after the corn is off with which it was sown, as their feet would injure the young plants. Sheep should not come on the following summer, because they would bite off the crown of the plants, and prevent their shooting again. A small quantity of soapers as a top-dressing will be of great service, if laid on the first winter.

If the fainfoin be cut just before it comes into bloom, it is admirable feed for horned cattle; and when cut thus early, will yield a second crop the same year: but if it proves a wet season, it is better to let it stand till its bloom is perfected: for great care must be taken in making it into hay, that the slowers do not drop off, as cows are very fond of them; and it requires more time in drying, than other hay. Sainfoin is so excellent a fodder for horses, that they require no oats while they eat it, although they be worked hard all the time. Sheep will also be fattened with it, safter than with any other food. A peck of sainfoin seed will go as far as a peck and half of oats for horses.

An acre of very ordinary land, when improved

by this grass, will maintain four cows very well, from the first of April to the end of November; and afford besides enough of hay to make the greater part of their food the four following months.

If the foil be tolerably good, a field of fainfoin will last from fifteen to twenty years in prime:
but at the end of seven or eight years, it will be
necessary to lay on a moderate coat of well-rotted
dung, or of marle if the foil be very light and
sandy. By such means the suture crops, and the
duration of the plants in health and vigor, will
be greatly increased and prolonged. Hence it
will appear, that for good land, there is nothing
equal to this grass in point of advantage to the
farmer.

Clover will last only two years in perfection; and if the soil be cold and moist, near half the plants will rot, and bald patches will be sound in every part of the field the second year. Besides, from our frequent rains during the month of September, many crops lest for feeding are lost. But from the quantity and excellent quality of sainfoin, its ripening early, and continuing in vigor so much longer, great risk and certain expence is avoided, and a large annual profit accrues to the farmer.\*

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<sup>\*</sup> Bath Soc. Trans. Vol. II. p. 367

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#### SECTION III.

## of BURNET.

THIS plant is the pimpinella of Linnæus, the pimprenelle of the French, and a native of our own country. Mr. Miller, in defcribing this plant, distinguishes seven different species of it; but the two larger forts are those which are most proper for the uses of husbandry, and are by him called the tragoselinum majus, umbella candida, or greater burnet saxifrage, with a white umbell, and the tragofelinum alterum majus, another greater burnet faxifrage, both natives of this island, and equally hardy. The first grows naturally in woods, and on the fides of banks near hedges; and the fecond grows naturally in dry pastures. In the meadows about Windsor, half the grass is burnet; and Mr. Rocque, of Walham-Green, who formerly tried many experiments upon it, found that it would grow on the drieft land; for he planted fome of it even in the gravel walks in his garden, where every thing elfe was burnt up in fummer; but necessary this

this never withered: one of the qualities of butnet being to continue in fap all the year.

This plant has been found to be of fingular utility where flocks of sheep are kept; because, as it preserves all its leaves unhurt by frost, the farmer may thereby have a constant stock of green food for his ewes and lambs, at a time when turnips, and other succulent plants, may fail him. Besides, it has been remarked, that nothing contributes more to improve the wool of sheep, than feeding them on this grass. For these reasons, I would strongly recommend the culture of this healthy evergreen to all sheep-farmers; and at least to mix a proportion of burnet with the other feeds, with which they lay down their lands to grass; for this will give a most profitable and useful variety in all meadows.

When burnet is cultivated by itself, the land on which it is sown should be in fine tilth, and free from weeds, especially couch grass, which is the most hurtful of all. The seed may be covered with a very light harrow, for it will not bear to be buried deep, and the ground should be rolled to lay it smooth for mowing. If the land is very poor, it should be dunged, and the seed may be sown any time between April and September.

Ten or twelve pounds of burnet-feed will be necessary

necessary for an acre of land; because, when burnet is thin, the plants grow so large, that the hay made of them is coarse. These will rise in eight or nine days after sowing. If great numbers of weeds come up with them, it will be less chargeable to let the weeds grow with the burnet, till it is about five or six inches high; than to weed or hoe it. The whole may then be moved and gathered clean off; and the quick growth of the burnet afterwards will choak all other weeds. The heart of the burnet being alalmost within the ground, the scythe cannot hurt it.

If the burnet does not grow equally every where, fome plants must be drawn where they are too thick, and planted where they are thinnest. Burnet may also be raised in a nursery, and may be transplanted like lucerne, or sainfoin, in the spring or autumn, when it should be set out at ten or twelve inches distance every way, according to the richness of the soil.

The feed fown in May might be mowed at the latter end of July. That fown in June, will yield a pretty good crop, and must be cut but once; and the same with that which is sowed in July. The plants produced by the seeds sown in August, should be mowed to destroy the weeds. These mowings may be either given green to horses,

horses, or be made into hay. The first springcutting will purge horses; and Mr. Rocque was of opinion it would also cure the grease: but it is only the first crop that purges.

Burnet should be moved but once the first year, in order to leave it rank in the winter; and in this case it will be ready to seed in February or March, or to mow again in April.

If natural grass grows amongst the burnet, it may be harrowed in the same manner as lucerne a for having a tap-root, the harrow will not hurt it: but it must not be plowed, lest the roots should be broken in the ground.

When the feeds of this plant are to be faved, it must neither be fed nor mowed in the spring. The seed will ripen about the middle of June, when it must be reaped like wheat, and threshed on a cloth. It should be threshed before it be too dry, because it is apt to shed, and should asterwards be dried thoroughly.

Burnet does not lose its leaves in drying; and though the hay made of it be sticky, it will after threshing be very agreeable to horses, which are so fond of it, that they never waste any. One acre will produce upwards of three loads of hay, and above forty bushels of seeds. Horses are sonder of this seed, than they are of oats: and Mr. Roeque was of opinion, that it is more pro-

per food for those that do not labour hard, because it is not of so hot a nature. Burnet bears seed twice a year, and will afterwards yield a very good spring crop.

It is not only good for horses, but also for all manner of cattle; even for swine: and Mr. Rocque experienced another virtue in it, which is, that being stung by a wasp, the leaves of this plant rubbed pretty hard on the part so injured, immediately took off the inflammation.

Mr. Worlidge mentions as another excellent quality of this plant, that all good housewives hold as an infallible rule, that there never need be bad cheese, or butter, where faxifrage grows: "from whence, adds he, it cometh that the Netherlands abound much in that commodity, and only, as is supposed, through the plenty of this herb."

The cultivation of this plant is attended with one great advantage, besides that of not requiring a rich soil; which is, that it proves an excellent winter pasture, when hardly any thing else vegetates. It never blows or hoves cattle. It will flourish well on poor, light, sandy, or stony soils, or even on dry chalky hills. The cultivation of it is neither hazardous nor expensive. After the first year, it will be attended with little or no ex-

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pence, as the flat circular spread of its leaves will keep down or prevent the growth of weeds.

On the failure of turnips, either from the fly or the black worm or flug, some farmers have sown the land with burnet, and in March following had a fine pasture for their sheep and lambs.

In Kent, they sometimes sow it late in the spring, with oats and barley, and it succeeds very well: but they generally sow it singly in the beginning of July, when there is a prospect of rain, on a small piece of land, and in October sollowing transplant it in rows two seet apart, and about a foot distant in the rows. This gives an opportunity of hocing the intervals in the succeeding spring and summer. Some horses will not eat it freely at first, but in two or three days they are generally very fond of it.

A gentleman near Maidstone sowed sour acres as soon as the crop of oats was got off, which was the latter end of August. He threw in twelve pounds of seed per acre, broad-cast; and no rain falling till the middle of September, the plants did not appear till the latter end of that month. There was, however, a good crop, and in spring he set the plants out with a turnip-hoe, at a foot distant from each other. But the drill mode is preserable, and saves more than half the seed.

This land was a poor, dry gravel, not worth three shillings an acre for any thing else.

The severest frost never injures this plant; and the oftener it is fed, the thicker are its leaves, which spring constantly from its roots.\*

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THERE are many species of this plant; but the forts generally cultivated for the food of cattle, are, the red, or Dutch clover (trifolium purpureum majus); the white meadow trefoil, honey-suckle grass, or white Dutch clover (trifolium pratense album); and the yellow meadow trefoil, or hop-clover (trifolium pratense luteum).

The red clover, too well known to need any particular description, is a biennial plant, whose roots decay after they have produced seeds: but if the plants are eaten down, or mowed, when they begin to flower, they will sprout out anew, by which means they will continue longer than they would otherwise. The usual quantity of seed for

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an acre is ten pounds; but many farmers give more, even to the length of twenty pounds, which is money thrown away; for if the land is in good tilth and good condition, fix or eight pounds at most are perfectly sufficient. In the choice of the seed, that which is of a light yellow colour, inclining to brown, should be preferred; and the pale coloured thin seed should be rejected.

The general custom in England is, to fow this clover with barley or oats in the fpring : and when the oats or barley are taken off the ground, the clover foreads and covers it, and remains one or two years: after which the land is plowed again for corn, and is really enriched by the clover, which being a fucculent plant, abforbs much nourishment from the atmosphere, and this tranfudes through its roots into the ground. The clover feed should not be fown till the barley or oats are four, five, or fix inches high; fo that it may not overtake or over-top these grains in its growth, by which means it would hurt them great-Iv. When the clover feed is fown, the field should be bush-harrowed, and if not wet, might be rolled to lay it smooth. If the barley or oats are drillfowed, the clover feed might be hoed in with the hand-hoe: this would deftroy the rifing weeds, ftir the earth, and cover the feeds; after which

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the field, if dry, may be rolled. There is another way of cultivating clover which I have practifed with great success, by sowing this seed along with wheat in the spring: whether the wheat be sown broad-cast or in drills. This may be done towards the middle or end of March, when the wheat is not above six, seven, or eight inches high, and may therefore be bush-harrowed and rolled as above directed for barley and oats. But if the wheat be drilled, the clover feed must then be hoed in, in the above mentioned manner; and this will be the second hoeing to the wheat, which should always receive one in the month of October or November.

The great advantage of this management is, that we thus have three profitable crops successively, at small expense. For the land is prepared for wheat by a fallowing crop of turnips or beans, &c. the wheat is followed by the clover with no extra expense but the seed; and the clover lay, plowed up, prepares the land for another crop of wheat; not only improved by the clover crop, but enriched by a fort of green dressing from the plant on the ground; and for this reason the second crop of the first year should be plowed in, or at least I would plow in the aftermath, without waiting for the second year of clover, in which the plant is so apt to decline.

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This fecond crop of wheat must again be succeeded by a thorough plowing, and an ameliorating crop as before, which again becomes the preparation for wheat, and thus the circle moves round ad infinitum, unless it be varied for better purpoles, dental to tens to all bearing street

If clover is to stand only one year, which is undoubtedly best on stiff moist land, I can see no objection to throwing in a bushel of rye-grass feeds per acre, along with it: for if the clover should fail, from any accident, still that will bring a crop: or if it proves thin from any unforeseen cause, the rye-grass will make good the crop, and it will fland too fhort a time to mat the ground, or do mischief. But if this practice be objected to, which it certainly is by many farmers, they may ftill guard against accidental failures, by fowing two or three pounds of the yellow trefoil or hop-clover feed along with the other; which will help greatly to infure a crop.

About the middle of May, this graft will be fit to cut; when particular care flould be taken in making it into hay; for it requires more time to dry, than common grafs; though the less labour that is given to accomplish this, the hay will be the better ! for, like other artificial graffes, the leaves and flowers of clover are its most material busies, in which the plant is to apt to decline.

and most useful parts; and therefore should not be shaken off by too much stirring and turning.

The time for cutting it is when it begins to flower; for if it stands much longer, the lower part of the stems, and the under leaves will turn vellow, and these last will fall off; and confequently the quantity of the hay will then be much diminished, and its flavor impaired. Care should likewife be taken, not to flack it till it be thoroughly dry, for fear of its heating.

When the weather is good, it is an easy matter to get clover well in; when it is rainy, this work is attended with much trouble; and as clover is extremely succulent, every precaution must be taken to prevent its heating in the stack, which will create a mouldiness that is not only disagreeable, but even noxious to cattle. One very useful precaution used is, to strew salt between the layers in the building of the rick, in the proportion of one pound to four hundred weight, or four pounds to the load. This will not only tend to prevent its heating or growing musty, but will also render it more wholesome, and consequently more fattening to cattle of de drant bride and

Another precaution is the using of chimneys made of thin boards, with holes pierced through them, in the form of an obelifk turned upfide down, fo as they may be drawn eafily out of the rick noisel

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rick before it is thatched. This will let off the hot and damp air from the center part of the rick; and if it be large, two fuch chimneys may be required. If this hay be got in tolerably dry, it is best to have it thatched immediately, for fear of rainy weather.

There are indeed two ways of preventing ricks from being hurt by rains: the first is, by a tarpawling or large sail tarred over, and hung on a round pole by means of eyes or loops in the middle of the cloth; by which contrivance it slides off or on, like a bed curtain on an iron rod, and hangs down equally on both sides, forming a tent roof; for cords being fixed to the bottom part of it, are drawn tight and staked or tied down exactly as tents are. This pole extends the whole length of the rick, and is supported by two perpendicular poles, one at each end.

The perpendicular poles are either fixed by being lunk into the earth, or by shorter poles forming a triangular support. The horizontal or roof pole, is sometimes suspended by ropes and pullies, so as to be lowered or hoisted at pleasure. But where there is a long lease, and the expence can be afforded, it is still better to have a shed made with a thatched roof, and sufficiently losty to build a good rick below it, with space between the rick and the roof for admitting a free circulation.

lation of air. This faves much trouble and more anxiety, and is preferable to a barn, which is too close for hay, that has any remaining moisture in it were no selfo good and the the supplier of because

One acre of clover will feed as many cattle as four or five acres of common grafs: but they must not be suffered to eat too plentifully of it at first, lest it burst them. It should be given them by degrees, till they are fully feafoned to it: nor should they ever be turned into this food in wet weather. Some fow rye-grafs among their clover, on purpose to prevent the ill consequence of cattle feeding on clover alone.

Mr. Maxwell thinks that clover is benefited by being fown with barley or oats; because, being weak and tender the first year, it would be overcome by weeds, which would grow in great numbers, if not kept down by a crop of corn, the stems of which, being at a sufficient distance to admit the air to the clover, will at the same time also protect it from drought. The stubble proves a farther protection after the corn is cut down; and when it rots, it manures the ground.

Mr. Tull, on the contrary, disapproves of fowing red clover with barley; because, he has known a crop greatly damaged by it in a wet furnmer. However, he also observes, that this may be prevented by drilling the clover after the barley is a in turners.

hand

hand high, or more: for then the barley will keep it under, and not fuffer it to grow to any confiderable fize, till after harvest. This I have already mentioned as being my own way of fowing it broad-cast.

much larger and stronger if sown in drills and hoed between the rows, than it does in the common broad-cast way. I do not, however, remember to have seen this done, except by Mr. Ducket, whose authority alone is indeed sufficient. His method of performing this is singular, for he drills it with a machine of his own invention, at the same time, and in the same surrows into which he drops the barley seed: whereas, it might certainly be done to more advantage after the barley is five or six inches high, and in the spaces between the rows of that grain, by means of Mr. Cooke's drill-plough, which would perform this work admirably.

The best way of saving the seed of clover is, what is mentioned by an Essex correspondent of the Bath Society, who relates, that a neighbour of his had a field containing thirty-eight acres; the soil is a cold wet clay, which, for some years after he held it, scarcely paid its rent. Determined, however, to see what could be done with it, he under-drained it, and in the Spring, 1775, mended

mended it with turf-earth, dug from the borders of fields and highways, and mixed with stabledung. In March he gave it a good plowing, and fowed it with Zealand barley: after the barley came up, he threw in ten pounds of the common red clover per acre. But fix or feven would have been sufficient. The advantages of the underdraining and manure were soon apparent. The barley yielded an exceeding fine crop, viz. seven quarters an acre throughout the field.

The following spring the clover shot early, and in the summer proved a very strong crop. In May he turned in all his cattle, which by the 10th of June eat it off quite bare. He then took them out, and let the clover stand for seed. The summer proving wet, it succeeded well; and the average produce of the field was seven bushels and an half per acre, the whole of which he sold at thirty-nine shillings per bushel, amounting in all to five hundred and sifty-sive pounds, sisteen shillings, or sourteen pounds, twelve shillings and six pence per acre, besides the feed to cattle.

As foon as the feed was off, the field was plowed for wheat, and fowed broad-cast with the red lammas kind. The crop was excellent, producing four quarters per acre.

With the same husbandry, this gentleman had thirty-nine bushels of clover seed from three

acres, though the feason was dry; but his land was better than that above described \*.

A gentleman farmer of Suffolk gives an account of his mode of managing clover to the fame Society; which he fays has always been attended with great fuccels.

In April, after his barley comes up, he fows about eight pounds of clover feed per acre, and rolls the land. This answers two good purposes, namely, pressing and covering the feed, and fixing the roots of the barley more firmly; which, in a light foil especially, is of great service.

After the corn is reaped, he forbears turning in any cattle till the crop of clover gets up pretty high and thick, which it will generally be by the end of October. He then turns in sheep and other small cattle for about a month, or, if the crop be large, six weeks. After this time it remains unsed till April. Cattle are then turned in, which eat it off pretty bare by May, at which time it is cleared for a crop of hay. If the season be not remarkably dry, it will be ready for the first cutting by the middle of June, and generally yields two tons per acre. This gentleman found from experience, that the nearer the ground clover is cut the better, if it be cut early; but if

Bath Soc. Trans. Vol. I. p. 53.

it has stood too long, the bottoms of the stalks will be dry and naked. Add to this, that the stalk being drained of its moissure, the root is also exhausted, and will require longer time, before it sends forth new shoots for a second crop. In that case it ought not to be cut so low, as the hay would be more sticky and coarse. If rain sollows the first cutting, the second crop will be ready about the 10th of September. The best time is when the slowers are all full blown, and the earliest begin to turn brown.

When the second crop is intended for seed, it is lest standing till near October. This makes it thresh the better, and there is no danger of the seed shedding in the sield.

In order to prevent the inconveniencies that feed clover is liable to in a wet autumn, half the crop should be left unsed in April; by which means it is fit for cutting near a month sooner than it otherwise would be; and the second, or seeding crop, is brought more into the summer. When the autumn proves wet, this method is attended with many advantages: the seed ripens better, and is threshed with much less trouble and expense. The sample is also better coloured, and the straw being less beaten to pieces, makes better fodder for cattle.

The best method to prevent cattle from being hoved

Spire !

hoved or choaked, by feeding on green clover, is, to let them remain at first no longer than till their bellies are full; and while feeding, to keep them constantly stirring. For as it is their greediness in swallowing the mouthfuls too fast, and before it is sufficiently chewed, which occasions these accidents; if they are interrupted frequently, so as to give time for the balls to fink into their maws before the next sollow, this will established the second of the second

Whenever, notwithstanding this precaution, any cattle swells or hoves, milk a cow that is well, and give the hoved beast a quart of the new milk, poured down its throat by means of a horn: if that does good, repeat the dose soon after. But if this fails, open a vein and stab it in the slank, near enough the hip bone, to prevent wounding the entrails. Put then a quill or reed into the orifice, to keep it open, that the wind may have a free passage; and keep the animal in gentle motion till it works it off and recovers its breath.

The white clover, or white honey suckle, as it is called by farmers, as also the several forts of meadow tresoil, being perennial plants, and belonging more properly to the subject of permanent pastures, will be treated of hereaster.

<sup>\*</sup> Bath Soc. Trans. Vol. I. p. 175.

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sump of bester grazing, selecompel them to sur

HIS grafs, which is C. Bauhin's Gramen Loliacaceum, angustiore folio, et Spica, darnelgrass with a narrow leaf and spike; and Linnæus's Lolium spica mutica, darnel with a chaffy spike: for darnel-grafs, rye-grafs, and ray-grafs, are only different names of one and the fame plant. We distinguish, indeed, two species of the ryegrafs, differing confiderably, viz. the foregoing. which is the tolium rubrum, or red-darnel, and the lolium album, or white-darnel. It is this last, which is chiefly cultivated in England, especially in strong, cold land, upon which it will succeed better than any other species, and is an earlier feed in the fpring; but it is formewhat coarse, and unless it be cut early for hay, it becomes hard and wiry; for this fort of grafs has but few leaves, and runs all to stalk. When cattle are turned in to feed on it, the remaining stalks or bents, as they are fometimes called, should be moved off in June; for otherwife they dry upon the ground, and

and give the pasture the disagreeable appearance of a stubble field, during all the latter part of summer; and are so troublesome to the cattle at feed, by tickling their nostrils, that nothing but want of better grazing, will compel them to eat of the young grass which shoots up between these withered stems. Besides, by permitting them to stand, the after growth of the grass is retarded, and the verdure of the fields is lost for several months. It is therefore good husbandry to mow them and make them into hay, which will feed work-horses in winter, and repay the expence.

In the foregoing section I have observed, that rye-grass is sometimes sowed with clover; and that this has its advantages and disadvantages.

If the land be wet and strong, it certainly insures a crop; being extremely hardy. Clover
thus mixed is sooner made into hay, with less
danger of heating; and, being succulent of itself, is rather improved by the mixture. It is a
very early grass, and is therefore useful for ewes
and lambs in the spring. It seldom lasts above
three or sour years, as it is commonly managed:
but if the nature of its roots, and their sending
forth sibres from their joints be considered, it
may surely be kept alive many years longer, by
dunging and other dressings. This would make
its roots tiller and meet; to the utter suppression

and destruction of all weeds, even couch-grass, not excepted. This grass mixed with clover makes good hay for winter's feed; but being a fibrous rooted plant, and binding the foil, this circumstance has led many to think that it greatly impoverishes the land.

Rye-grass is more cultivated in Scotland and in the north of England, than in this part of the country, and they there find many advantages from the culture of it. Its excellence in destroying weeds, in agreeing with wettish and even boggy foils, in resisting frosts, and its nursing and bringing up clover, where otherwise it would not succeed, are all strong recommendations of it, in the northern parts of this island.

They are not there of opinion, that it injures the crop of corn with which it is fown; but, on the contrary, when the foil is loofe and open, they think it makes it firm, and prevents the corn from being lodged. Though this is the common method, yet they think it better to fow rye-grafs by itfelf, if the land be poor, and still better to fummer fallow it, and fow it in autumn.

They there fow it sometimes for hay, and sometimes for pasture. It rises early in the spring, and if the soil be dry and warm, affords good pasture all the winter. The best way to manage it, say they, is to cut it in spring, or the beginning of Vor. H. Ee summer: fummer; for when allowed to get up in fummer. it runs to feed and becomes disagreeable to cattle: besides, by this method a good crop may be expected in autumn; and when thus managed it makes good hay.

There has hitherto been fo complete an ignorance, and want of attention to the use of proper grass seeds, for laying down land, that the farmer has had no other resource, but in red and white clover, and in rye-grass: he never dreamed of collecting any other feeds for this purpose, and could find none other in the feed-shops. When, therefore, he deviated from this trodden path, he did what was infinitely worse; for, by collecting the feeds of grafs from his own hay-loft, or that of his neighbour, he doubtless collected a greater variety of feeds, but a very dangerous one, in which those of weeds made no inconsiderable proportion was the first his policy of smell tod

To those husbandmen therefore, who have no opportunity, or industry, to increase their refources, I must still recommend the red and white clover, the common trefoil or hop-clover, the burnet, and the rye-grais, as the only feeds they can properly use; and if their land be tolerably dry and in good condition, they will not fail, with the accession of other natural grasses, to form a fwerd in the course of a few years.

SECTION

# fict that you remains uncut. This plant is at the portant and translated and Thought first high, and is thick and full of

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and it may be ent tout times in a year IN France, a new artificial grass has been difcovered; if I may be allowed to give that name, and description to a plant, which, though long known, has never been confidered as a fodder for cattle, till very lately that it has been mentioned as fuch, in a Memoir of Agriculture, published at Paris. The writer of the article is a M. Creté de Palluet, at St. Denis, near Paris, who strongly recommends the cultivation of the greater fuccory, or wild endive, and mentions its many advantages, particularly as being an excellent food for horses, cattle, and sheep; as being eafily cultivated; as not being affected by the drought of fummer, or by the fevere ftorms of autumn, or by the frosts of winter; and lastly. as yielding a great weight of provender.

"The foil, fays this writer, on which I fowed my succory, is a light sand of a middling quality: the product may appear exaggerated, nordo I wish my word alone to be taken in this case.

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What I advance can be proved by the part of the field that yet remains uncut. This plant is at the present time, the 20th of June 1787, seven, and even eight feet high, and is thick and full of leaves. The product of one cutting on an arpent (which is nearly four fifths of an English acre), may be rated at fifty-five thousand weight, and it may be cut four times in a year." This is a wonderful produce, and will no doubt attract the attention of our experimental farmers, who ought to make accurate trials to ascertain the produce and the effects of this fodder, both when green and when made into hay.

The author fays, a bushel of seed will be enough for an arpent. It may be sown in the spring, either alone, or along with a crop of spring corn, or with clover. It is perennial, and requires no extraordinary care. When made into hay, it was well relished by cattle; but this writer thinks it more profitably employed when given green.

The Rev. Mr. Cooke, in a journey he made into France, law this plant growing in the fields of M. de Palluet, at St. Denis: he was greatly firuck with the luxuriant growth of the plant, and with the accounts he received of it, and was thereby induced to bring home a small quantity of the seeds, which he has distributed to some of

his experimental friends; so that from them we may expect to learn the result with certainty.

At all events we may conclude, from the above directions of M. Creté, relative to its culture, that he must not be a very skilful agriculturist, when he speaks of sowing it with spring corn or with clover, at the same time that he mentions, its being sit to cut four times a year, and its growing to seven or eight seet high at each cutting. Under such circumstances, the sate of the spring corn, or clover, may easily be foretold.

SECTION L.

### OF WELDOWS.

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The HATE VIR crop is to be ferred, fet, or planted on arche lend, it said piecas on provides to have it clean and in good thirl; but it also not acongener the case, shill there may be a toictable crop from it, and the farmer has it in a toictable crop from it, and the farmer has it in a toictable crop it, into better order, when we are a time order wife in laying down a field to grass the other wife in laying down a field to grass and Y. A 2 2 3 cland should sellen period good order

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Of the Culture and Managemement of Grafs-Lands.

#### SECTION I.

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#### Of MEADOWS.

WHATEVER crop is to be fowed, fet, or planted on arable land, it is of great importance to have it clean and in good tilth; but if that is not altogether the case, still there may be a tolerable crop from it, and the sarmer has it in his power to bring it into better order, when preparing it for a succeeding crop.

It is far otherwise in laying down a field to grass with a view to form a permanent meadow; and therefore the land should be in perfect good order in every respect before this is attempted. After what I have so often had occasion to repeat in the course of this work, it is no doubt supersuous to explain what I mean by land in perfect good order; unless I were here again to revert to those first principles with which I set out, that land made dry by draining, clean by weeding, friable by plowing, and sertile by manuring, is land in the best order.

Let us then conclude, that every skilful and industrious farmer would make a point of having his land in this condition, before he lays it down to grass. When this is the case, I do not object to the grass seeds being sown in the spring along with corn, such as barley or oats, or buck-wheat

This practice, besides the profit arising from the crop of grain, which must be large from such ground, will be attended with some other advantages, which are miffed by autumnal fowing. In the first place, the spring is the natural season for all feeds to shoot; the crop of grain protects the shooting seed from the heat of the sun, through the whole of the fummer: the plants of grain while young, but particularly the buck-wheat, are rather discharging a nourishing sap into the ground, than taking any from it; by which means the young graffes are fed, not famished, in their tender age ; and by the time the grains are befeelon ginning Ee 4

ginning to draw the nourishment, the grasses are in a good way, with sufficient strength and vigor to take care of themselves. The frosts of autumn cannot injure them, the severer ones of winter cannot throw them out of the ground, and thus they acquire good roots, and flourish early in spring.

The time of fowing the grafs feeds must be regulated in the fame manner as I have mentioned for the fowing of clover, that is, when the barley or oats with which they are fowed is from four to fix inches high; but if fowed with buckwheat, they may be both committed to the ground at the same time; for the buck-wheat is fo rapid, as to require no advantage in point of time. When the grass seeds are fown, the bush harrow drawn over the lands lengthways, and the roller across them, will bury the feed sufficiently. If they be fown when the ground is a little moift, it will be the better: it may be bush-harrowed immediately, but the rolling should be delayed till it is dry. It should be again bush-harrowed and rolled in the end of September or beginning of October.

In these directions, I differ very essentially from Mr. Miller, who thinks, that when ground is laid down to grass, no other feeds should be sown along with those of the grasses, and that the best grasses.

feafon to fow them in is about the middle of September, or fooner, when the land is dry, with an appearance of rain; because, the ground being warm, and fome showers falling after the feed is fown, the grass will foon rise and get sufficient rooting in the ground before winter, not to be in danger of being turned out by the frost, especially if the ground be well rolled before the frost comes on. If the grafs comes up well, this rolling should be performed towards the end of October or beginning of November, and repeated again the beginning of March. But Mr. Miller forgets in giving this direction, that in stiff land and rainy feafons, it is impossible to roll the land at either of the above mentioned times without poaching it, so as to do more harm than good. The fwerd, fays he, will in this case, be close joined at the bottom, and a good crop of hay may be expected the fame fummer. In cold lands, which lie very open and exposed, it will be right to fow the feeds a month earlier, that the grass may have time to get good rooting, before the cold feafon comes on to stop its growth. If the ground cannot be prepared for fowing in autumn, it may be fown in the middle or latter end of March, according as the feafon is early or late. The danger of fowing late in the fpring, is dry weather, particularly if the foil be dry and light. It will then

be proper to roll the ground well soon after the seeds are sown, to settle the surface and prevent their being blown away by the high winds in March. But it is here observable, that this circumstance is a strong argument in savor of sowing these seeds with a spring crop of corn, which would consolidate the land, and shade it previous to the sowing of the grass seeds.

I have no doubt but that the autumnal fowing recommended by Mr. Miller, would succeed
extremely well on good lands, and in favorable
seasons. I think the way I have ventured to recommend more certain, for I once laid down a
field to grass in autumn after a fallow, and sowed
it about the end of August: the frosts that season
happened to come on early, and turned out the
whole of the grass-seeds, in so much that I had
no appearance of a crop in the spring; so that I
was obliged to harrow it in April, and sow it
again with grass-seeds; which then came up very
well, and made a good swerd.

It has been observed by Mr. Stillingsleet, that it is wonderful to see how long mankind have neglected to make a proper advantage of plants, of such advantage as graffes are, and which are the chief food of cattle in almost every country: the husbandman, for want of distinguishing and electing graffes for seed, fills his pastures either with

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with weeds, or with bad and improper graffes: when by making a right choice, he might be fure to have the best grass, and in the greatest abundance that the land could admit of. The common flovenly way of taking feeds from the havrick, not only subjects the farmer to the inconvenience of fowing a great mixture of rubbish, but also the feeds of many plants unfit for his foil: for the feeds fowed on a dry foil, may have many only fuitable to a moift foil, and those fowed on a moist foil, may have many only suitable to a dry one. And May a my said and

Arguments, however, in favor of established custom, are never wanting to the prejudiced and indolent farmer, who will tells us, that it is of little consequence what seeds are used in the first laying down of ground; for if it be well tilled, and in good heart, it will foon produce fpontaneously natural plants enough to form a swerd. There is no doubt of this fact; and in many parts of Derbyshire, the indolent farmer does nothing but inclose his land, and defend it from cattle. without fowing it at all, when he wishes to have it converted into meadow. But is this any rational argument, or is it any proof of what is best to be done? Clearly not; for let the same farmer prepare his land properly, felect and fow good feeds, and in the course of a few years he kings.

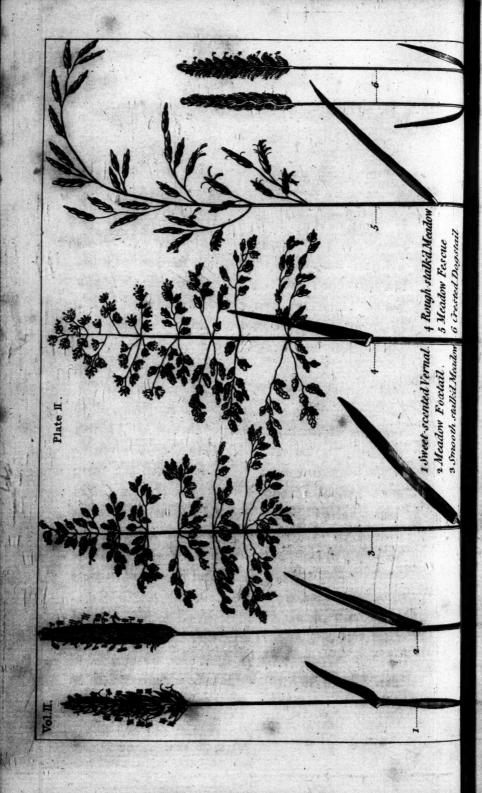
will find his profit from this fentible mode of proceeding, both in the quantity and quality of the product.

In my account of rye-grass, I have mentioned those seeds, with which the farmers in this country constantly lay down their lands to grass. I have there ventured to recommend a mixture of burnet as a most useful addition to their list: but how desireable would it be, if they could still add a few more of our best native grass seed; for native grasses, for this purpose, are far preferable to foreign ones, which will always wear out by degrees, and give way to the natives.

The number of graffes fit for the farmer, fays Stillingfleet, is few; perhaps half a dozen, or half a fcore, are all he need to cultivate; and how fmall the trouble would be of fuch a talk, and how great the benefit, must be obvious to every one at first fight. Would not any one be looked upon as wild, who should sow wheat, barley, oats, rye, &cc. &cc. along with the feeds of all forts of weeds? yet how is it much less abfurd to do, what is equivalent with respect to graffes?

Mr. Curtis, at his botanic garden, Lambeth-Marth, has the merit to have been the first that I know of, to have cultivated various grasses, and to have faved their feeds for sale. He in particular has recommended the culture of the different kinds,





kinds, of which he has given the following de-

1. The fweet fcented vernal grafs, (anthexanthum odoratum), which, of all the English grasfes, comes the first into bloffom, except the blue dog's tail grass: it is therefore valuable as an early grass: it is valuable also for its readiness to grow in all foils and fituations, being found in bogs, in woods, in rich meadows, and in dry pastures: in point of crop, it is not so productive as fome, yet more so than others: cattle appear to be fond of it, and it is well known to be the only English grass which is odoriferous : the agreeable fcent of new made hay arises entirely from this grafs: hence its name of odoratum, or fweet scented. The green leaves, when bruised, readily impart their perfume to the fingers, by which means the foliage may at all times be known; and persons not skilled in botany may distinguish it, when in bloffom, by its having two threads or Ramina to each flower. The sel train is it when the

3 Smooth stalked Meadow

Of the fix several graffes recommended by Mr. Curtis, this is the least productive in point of seed.

tensis) produces its spike almost, and in some stuations to the full, as early as the former: hence it is equally valuable as an early grass; and as it

is much larger, and quicker in its growth, it is confequently much more productive; it shoots very rapidly after mowing, producing a plentiful aftermath; and where land is rich, and two crops are not thought too much for it to bear, this feems to be the best adapted to such a purpose, and should therefore form a principal part of the crop. Its foliage may, perhaps, appear coarfe to some; but it should be remembered, that no English grass can be productive, that is not in some degree coarse. In general, the great advantage arifing from the earliness of this and the preceding grafs, is entirely loft at a diffance from London, where hay making commences late, and where the husbandman feems to wait for a crop of universal indifcriminate herbage, rather than one of grafs, respond takin on excelling aladi and and

The meadow fox-tail is more confined as to its growth; thriving naturally in a moist foil only; hence it is best adapted to improve very wet ground, that may be drained of its superstuous moisture, or to form or meliorate meadows that have a moist bottom, and are not apt to be burnt up in dry summers.

Its feeds are easily collected; but a great number of them, one third at least, are yearly destroyed by a very minute orange-coloured larva or maggot, which feeds on the embryo of the

feed.

feed, and produces a very small musica or fly, probably the musica-frit of Linnæus. The Rev. Mr. Swaine has made the same observations with respect to this insect, which destroys the seed of the meadow fox-tail; and seems to be apprehensive from the difficulty of collecting it uninjured, that it will be impossible ever to make it an object of general culture.\*

This grass is distinguished, in some degree, by the largeness of its soliage, and by its producing a soft spike on a long stalk early in May. The meadow cat's-tail grass produces a spike somewhat similar, but rougher to the touch, and much later in the summer.

3. Smooth-stalked meadow-grass (pon praters). The soliage of this grass begins to shoot, and to assume a beautiful verdure very early in the spring; but its slowering stems are not produceed so soon, by at least a week, as those of the meadow foxtail. This trisling difference however, in point of earliness of slowering, does not prevent it from ranking very properly with the two preceding; and, where early grassy pasturage is a desideratum, Mr. Curtis is of opinion it cannot better be obtained than by a combination of these three; if a crop be at the same time an object, the meadow fox-tail grass should predominate.

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This grass rather affects a dry than a moist situation; and hence it keeps its verdure in long continued dry weather, better than most others; but it will thrive in either; will grow on the top of a dry wall, but much more luxuriantly in a rich meadow; it is to be observed, however, that it has a root which creeps like the couch-grass, and is almost as difficult to extirpate: it ought, therefore, to be cautiously introduced, where the pasturage is not intended to be permanent.

The characters which serve to distinguish the poa pratensis from the poa trivialis, are, that the former has a smooth stalk, the latter a rough one, perceptible when drawn betwixt the thumb and singer, and which arises from little sharp points, visible when the sheath of the leaf which covers the stalk is magnified. The trivialis has a long pointed membrane at the base of the leaf; the pratensis a short blunt one.

A. Rough-stalked meadow-grass (poa trivialis). Similar as this and the preceding grass are in their appearance, particularly in their mode of flowering, they differ very effentially in their qualities. While the smooth-stalked meadow-grass is found chiefly in dry pastures, the rough-stalked occurs principally in mois meadows, or on the edges of wet ditches: it loves moisture, and a situation that is rather shady: hence, though there are few grasses

graffes more productive, or better adapted for hay or pasturage, it is a tender grass, and liable to be injured by extreme cold, or excessive drought: in wet ground, near the Thames, it has been observed to grow very tall, while on poor land it is seen to be altogether as diminutive: it is perhaps no small recommendation of it, that it is a principal grass in that uncommonly productive meadow near Salisbury, which I shall have occasion to mention hereafter.

It is remarkable, that the feeds of the pea trivialis and pea prateries, but more especially those of the former, are apt to be entangled, and adhere to each other, as if cobwebs had been intermixed with them.

5. Meadow fescue-grass (festuca pratensis). Of the several grasses here recommended, this comes the nearest in its appearance to rye-grass, to which, however, it seems in many respects to be superior, at least for the purpose of forming or improving meadows: it is larger, and more productive of foliage; it is strictly perennial, it is very hardy, and will thrive not only in very wet, but also in dry ground: it has been found in the sand-pits at Charlton, and the ofter-grounds at Battersea; and it abounds in the very best meadows about London. Mr. Curtis knows of no grass more likely to supply the deficiencies com-

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plained of in rye-grass; and yet it has not, that he knows, been particularly recommended. One quality it has, which bids fair to introduce it quickly into more general use; it produces more seeds than any of the others, and they are easily gathered, and grow readily. In one respect, it is inserior to the three former grasses, it does not produce its flowering stems earlier than about the middle of June, a fortnight or three weeks later than the meadow fox-tail; yet it cannot be considered as a late grass, as most of the Agrossis tribe, and the meadow cat's tail, slower at least three weeks later. It must be carefully distinguished from the festica elation, or tall sesses, which is a very similar, but much coarser grass.

6. Crefted dog's tail grais (Cynofurus criftatus). It is chiefly from the great character which this grais bears as a favorite and wholesome food for sheep, and from its being found in our soundest and best pastures, that it is here recommended. It grows naturally in dry situations, and will not thrive in meadows that are very wet: it slowers about the same time as the meadow sessee, and is not very productive of soliage. As its slowering stems are always left untouched by cattle, its seeds may casily be collected, where the pasturage is sed, not mown.

-nOf the above fix graffes, it will appear that the

meadow fox-tail, and rough stalked meadow, are fittest for moist land.

The meadow fescue, and sweet scented vernal, are fittest for land either moist or moderately dry.

The smooth-stalked meadow, and crested dog'stail, are sittest for dry pasture.

The order of their flowering is,

3; Sweet-scented vernal; 2, meadow fox-tail;
3; smooth-stalked meadow; 4, rough-stalked meadow; 5, meadow fescue; 6. crested dog's tail.

Mr. Curtis could easily have added many more grasses to this list, and those too highly deserving of a place in it; but by recommending too many, the difficulty of introducing any might be increased, without an adequate advantage from the variety. I will, however, avail myself of his information, to mention such other of the English grasses as appeared to him most worthy of observation, viz.

Tall oat-grafs, (avena elatior): common in wet meadows, and by the fides of hedges; early, and very productive, but coarfe.

Yellow oat-grass, (avena flavescens): affects a dry soil, is early, and productive; bids fair to make a good sheep-pasture.

Rough oat-grass, (avena pubescens): soil and si-

tuation nearly fimilar to that of the meadow fefcue: early, hardy, and productive.

Upright brome-grass, (bromus erectus): peculiar to chalky foils, early, and productive; promiles to be a good grass for chalky lands, and thrives indeed very well on others.

Blue dog's-tailigrafs, (cynosurus caruleus): earliest of all the graffes, grows naturally on the highest lime-stone rocks in the northern parts of Great-Britain; not very productive, yet may, perhaps, answer in certain situations, especially as a grafs for sheep; bears the drought of summer remarkably well: at all events, seems more likely to answer than the sheep's sescue-grass, on which such encomiums have been most unjustly lavished.\*

Rough cock's foot grafs, (dattylis glomeratus):

a rough,

<sup>\*</sup> From this observation, Mr. Curtis seems to have no great opinion of the sheep's sescue, which is so much admired by others, and of which the Rev. Mr. Swaine writes thus to the Bath Society, (Vol. II. p. 83.) " I apprehend this grass to be the most valuable of all. It was observed to grow and thrive on lands of all qualities, and in all situations, from the driest upland pastures, to the very most parts of meadows. It does not part with the seeds till some time after they are ripe, and even quite dry. It makes the thickest and clearest pile of any of them, and sends up but sew slower stalks in proportion to its leaves. I am almost persuaded, that this grass will hereafter become as generally cultivated as ray-grass is at present, It slowers in June, and is ripe in July."

a rough, coarse grass, but extremely hardy and productive; soil and situation the same as for the meadow sescue.

Tall fescue grass, (festuca elatior): tall and coarse, but very productive; affects wet situations.

Hard fescue grass, (festuca durinscula): affects such situations as the smooth-stalked meadow-grass; is early, and tolerably productive: its soliage is sine, and of a beautiful green; hence it has been thought very sit for a grass-plot or bowling-green; but it is apt to grow thin and die away.

Meadow cat's-tail grass, (pbleum pratense): affects wet situations, is very productive, but coarse and late.

Mr. Curtis has formed a packet of the fix forts of feeds above mentioned, and gives the following directions for cultivating them.

If a piece of ground can be had, that is neither very moist nor very dry, it will answer for all the seeds; they may then be sown on one spot; but if such a piece cannot be obtained, they must be sown on separate spots, according to their respective qualities; no matter whether in a garden, a nursery, or a field, provided it be well fetured and clean. Dig up the ground level, and rake it, then sow each kind of seed thinly in a

feparate row, each row about a foot apart, and cover them over lightly with the earth: the latter end of August, or beginning of September, will be the most proper time for this business. If the weather be not uncommonly dry, the seeds will quickly vegetate; and the only attention they will require will be, to be carefully weeded: in about a fortnight from their coming up, such of the plants as grow thickly together may be thinned, and those which are up transplanted, so as to make more rows of the same grass.

If the winter should be very severe, though natives, as seedlings they may receive injury; therefore it will not be amiss to protect them with mats, fern, or by some other contrivance.

Advantage should be taken of the first dry weather in the spring, to roll or tread them down, in order to sasten their roots in the earth, which the frost generally loosens: care must still be taken to keep them perfectly clear from weeds. As the spring advances, many of them will throw up their flowering stems, and some of them will continue to do so all the summer. As the seed in each spike or panicle ripens, it should be very carefully gathered, and sown in the autumn, at which time the roots of the original plants, which will now bear separating, should be divided and transplanted, so as to form more rows: the roots

of the smooth-stalked meadow-grass, in particular, creeping like couch-grass, may readily be increased in this way; and thus, by degrees, a large plantation of these grasses may be formed, and much seed collected.

While the feeds are thus increasing, the piece or pieces of ground which are intended to be laid down, should be got in order. If very foul, perhaps the best practice (if pasture land) will be to pare off the swerd and burn it on the ground; or if this should not be thought adviseable, it will be proper to plow up the land and harrow it repeatedly; burning the roots of couch-grass, and other noxious plants, till the ground is become tolerably clean; to render it perfectly so, some hocing crop, as potatoes or turnips, should be planted or sown.

In this mode, the ground proposed to be laid down, will be got into excellent order, without much expence; and being now ready to form into a meadow or pasture, should be sown broadcast, with the following composition, and in these proportions.

CARROLL STORM CARTA HASTELS ASSESSED AND COMPANY	Automation for a rank was
Meadow fox tail	one pint
Meadow-fefcue	one ditto
Smooth stalked meadow	half ditto
Rough-stalked meadow	half ditto
Crested dog's-tail	quarter ditto
Sweet-scented vernal	quarter ditto
Ff4	Dutch-

Dutch-clover, trifolium repens ..... half ditto Wild red-clover, trifolium pratense, or que

in its stead, broad-clover of the shops, half ditto Note. For wet land, the crested dog's-tail, and smooth-stalked meadow, may be omitted, especially the former.

Such a composition as this, sown in the proportion of about two to two and a half bushels per acre, on a fuitable foil, in a favorable fituation, would, as Mr. Curtis afferts, form in two years a most excellent meadow; and as all the plants fown, are strong, hearty perennials, they will not eafily fuffer their places to be usurped by any noxious plants, which by manure or other means, in spite of all our endeavours, will be apt to infinuate themselves : if they should, they must be carefully extirpated, for fuch a meadow is deferving of the greatest attention; and Mr. Curtis feems to have fittle doubt, but at fome future times it will become as common a practice; to low meadows with a composition somewhat like this, as it now is to fow a field of wheat or barley.

There is, indeed, no doubt but that this composition is a selection of very excellent grasses: but Mr. Curtis has mentioned two, which he has not described, and which deserve to be so, that they may be well understood by the husbandman.

The trifolium pratense purpureum, or red meadow trefoil,

trefoil, as it is commonly called, is a native of Great-Britain, and found on the highest mountains of Scotland. This grass is also known by the name of cow-grass and cow-clover. It is perennial, and is easily diffinguished from the common broad clover; with which however it has been often confounded, even by botanists. The stalks of the red trefoil are weak and hairy, the stipulæ which embrace the foot stalks of the leaves are narrow and very hairy: the heads of the flowers are rounder than, and not fo hairy as, those of the clover, whose stalks are strong, almost smooth, furrowed, and rife twice the height of the other. The heads of the flowers of the meadow-trefoil are larger, more oval, and more hairy, than those of clover; their petals open much wider, and their tubes are forter.

The trifolium alpestre of Linnæus, is another species of the same genus of plants, and is distinguished from the former, by having longer and narrower leaves and a creeping root, which also is perennial. This in meadows and pastures is a valuable plant; but its feed is not to be found in the shops. Mr. Curtis is of opinion, that this is the plant properly called cow-grass. It is by some called marle-grass.

The species called yellow meadow trefoil, or hop-

hop-clover, is the trifolium pratense luteum, capitula lupuli; and the smaller kind of this, commonly called none-such, or black-seed, is the trifolium luteum, lupulinum, minimum. The former is what I have before mentioned, as being much used in this country for sowing with clover: it is a hardy perennial plant, and is reckoned very wholesome for horses.

Our meadows afford us the white meadow trefoil, or honey fuckle grafs, best known by the name of white Dutch clover, which is the trifolium pratense album of C. Bauhin, or trifolium repens of Mr. Curtis, and by far the best fort of clover for lafting pastures or meadows, because it is the fweetest and most abiding of all the plants of this kind. This white clover, besides being perennial, fends forth roots and shoots from every joint of its long trailing branches; for it does not rife high, and thereby forms the closest swerd of any of the artificial graffes. It is exceedingly fweet for all forts of cattle: for which reason a quantity of the feeds of this plant should always be sown with the other grass seeds, on whatever land is intended to be laid down, and makes part of Mr. Curtis's composition for this purpose.

The feeds of this clover being imported annually from Holland in large quantities, is the reason why it has acquired the name of Dutch clover; clover: though it is not more a native of that country than of this; for it is very common in the pastures all over England. The seeds however, have never been much collected here, though they may be saved as easily as those of the broad clover. It might therefore be worth the farmers while to sow an acre or two with this white clover unmixed, merely for the sake of its seeds, which are often sold at a great price. He would thus save the expence of buying them himself, and would find purchasers for any quantity he had to spare.

With respect to the manuring of meadows, it is necessary to observe, that unmixed dung cannot be laid over them with any degree of œconomy or effect, because it will be dried, parched, and exhausted by the sun, air, and wind, before its mucilage and juices are washed into the soil.

To employ it therefore with most effect, it should be intimately mixed with good mould or chalk, or road drift, or ashes, or in short any dry stuff, which shall have previously absorbed its rich juices, and which, by still detaining themserves as the vehicle to convey them into the soil. Soap-ashes thus mixed with dung, is an excellent dressing; as is sugar-scum, and a variety of such articles. The drainings of the farm yard are a very

very excellent dreffing for a meadow, conveyed over it either by means of small drains, or by a watercart and pierced box; such as is used for watering the streets and roads around London.

It would be much the best way to tine-harrow a meadow before it is dressed; both to open the surface, and make a way for the manure to sub-side and reach the roots of the plants, and also to clear off the moss and other weeds that may have matted on the surface. M. Chateauvieux's three-coultered plough seems to me an admirable implement for this purpose; nor do I know any reason why it has not hitherto been very universally adopted in this country: Mr. Baker, of Dublin, made use of it very successfully, under the name of a scarificator.

This implement is extremely simple, having only a beam, with three coulters fixed in it, and two handles, like those of a plough, by which it is guided: the coulters are placed, two before and one behind, forming a triangle; and the distance at which they cut the foil is three or four inches. I prefer this implement to what we now give the name of scarificator, or drag-harrow: this is not, in my opinion, near so effectual for opening the earth, and cutting the roots of the plants, which makes them shoot out afresh.

This three-coultered plough might be improved

by wheels to regulate the depth to which the coulters should go; and these might be increased to five in number: A meadow should be manured every second or third year, if we expect it to be productive.

The watering of meadows, where there is an opportunity to do it with advantage, is another great fource of their fertility. Much difference of opinion has arisen, even amongst the farmers themselves, about the real cause of the fertility occasioned by this operation: but I apprehend it may flow from different causes, according to the nature and situation of the waters employed.

At Orcheston St. Mary, about nine miles from Salisbury, there is a very singular small meadow, of about two acres and an half, belonging to Lord Rivers. It is fituated on a little brook, is frequently overflowed, and sometimes continues so great part of the winter, and bears the greatest burthen in a wet season. The grass upon it generally grows to the height of about eighteen inches, and then falls and runs along the ground in knots, to the length of sixteen or eighteen seet: but the sarmer has known instances of its running to twenty-five seet in length.

It is mowed twice in a feafon, and the average quantity is generally about twelve loads, or tons of hay, the first mowing, and fix the second, though

though sometimes consideraby more. The tythe of this meadow has been compounded for at nine pounds a year.

The grafs is of a fweet nature : all cattle and even pigs eat it very greedily. When made into hay, it is excellent, and improves beafts greatly. The farmer fays, his horfes will eat it in preference to corn mixed with chaff, when both are fet before them together. It is thought, that this grass is a species of the agrostis polymorpha, mentioned by Hudson in his Flora Anglica . Be that as it may, the extreme fertility of this little fpot is no doubt owing to its being overflowed in the winter and spring by the adjoining stream: for, upon inquiry, it has been found, that when the feafon is dry, and it has not been overflowed, the crop of grass is not near so large. It has also been found, that the little stream with which it is watered, takes its rife from among fome limestone rocks, and comes down impregnated with that calcareous matter. and to add a dark of the

Heat and moisture are doubtless the primary causes of vegetation, and therefore water, taken merely as a fluid, and carried over dry lands, will, when followed by heat, promote vegetation; but

<sup>\*</sup> Bath Soc. Trans. Vol. I. p. 97. Mr. Curtis having examined the grass of this meadow very particularly, found a principal plant among it to be the poa trivialis.

if these waters are impregnated with any noxious minerals, such as copperas, alum, sulphur, &c. they will check vegetation: if, on the contrary, they are impregnated with calcareous earths, as I have mentioned above, or if they are charged with manure, the drainage of farm yards, sine pulverized earth, &c. &c. which they deposit on those lands they overflow; then the cause of the great sertility of those lands is visible, and that fertility will be increased in proportion to the quantity of calcareous or seculent matter there deposited.

Those farmers who have, from their situation, opportunities of watering their meadows, very justly observe, that the water which has been used, or strained, as they call it, is not so effectual as what comes immediately from the stream or river: this is natural, for the water having already made a deposit of the matter with which it was charged, cannot be supposed to make another equally great. But in using water for this purpose, it would be an easy matter to estimate its value, by putting some into a milk pan, and letting it stand for sive or ten days, to observe what deposit it makes; or by siltrating it through fine blossom paper.

Watering of meadows has this advantage over other modes of conveying manure; that by subsiding, it carries down with it the fertilizing matter, which is thus conveyed to the roots of the plants, where it is really required. Watering also promotes the putrefaction of every vegetable and animal substance found in the earth, and thereby contributes greatly to meliorate the soil underneath the swerd.

If the spring proves dry, pastures may be watered as soon as the frosty season is over: and this may be continued till the grass begins to shoot. But if the winter has been severe, and the earth remains moist, no current of water should be admitted, till the earth loosened by the frost is settled, and the surface become pretty dry: for even the gentlest current would carry off the sine mould loosened by the frost. After the grass has begun to shoot, and the weather is become mild, the water should be administered more sparingly. Care should be taken not to allow cattle to come upon land which has been lately watered, as they will hurt it much by poaching.

When there is a complete command of water, by means of channels and drains, the meadows may be overflowed after the first crop of hay is off the ground; but then only in the night time. When the second crop of hay is off, the weather then becomes cooler, and the flooding may be used more freely, which will bring up a large crop of aftermath. The latter end of autumn is the sea-

fon when the water is richest and most impregnated, and may be the longest continued; but care should be taken to let it off, before any frost appears. The channels for conveying the water over the meadows should have a very gentle declivity, as well as the drains which carry it off. One inch in an hundred feet is enough for the former, and one half that fall is sufficient for the latter. The channels should be led along the highest parts of the meadow; they should be wide rather than deep, and diminish as they go, that they may more easily overflow. The drains, on the contrary, should be on the lowest ground, and increase as they run, that the waters may retire gently, and without devastation.

Watering or flooding of meadows, where the water is good, has added so amazingly to their fecundity, that it has often been thought worth while to be at the expence of erecting mills, and other engines, to raise the water for overflowing them.

When the produce of meadows is to be made into hay, the farmer will be directed in the feafon of mowing it, by the quality of the grass. When the crop is heavy, it should be cut as soon as the bottom of the grass grows yellow: for if it stands longer, more will be lost by the rotting of the lower leaves, and the bad flavor they will com-

municate, than will be gained by any additional growth.

When circumstances admit, the proper choice of time for cutting is, when the grass is in full bloom, and rather earlier than later, lest the stalks begin to harden; besides, the more sap that remains in the root, the sooner the next crop will spring up. A dewy or dusky morning is best for cutting the grass; for being then sullest of sap, it stands best to the scythe. In the noon tide sun it is dry, and reclines its head.

Farmers in general are not fufficiently attentive to their hay-making. The great object to be attained is, to have it quite dry, that is, free from extraneous moisture; but not from its natural sap, which should be preserved as much as possible, and never will hurt it. The less hay is turned, or tumbled about, the better, so it be dry; and to accomplish this, requires both attention and skill. A strict observation of the weather is so necessary to direct all the operations of hay-making, that general rules only can be given, and the rest must be lest to prudence and practice.

Before I close this section, it is necessary for me to observe, that different attempts have been made at different times, to introduce some of the American grasses here; but without any success, that I have ever heard of. The Society of Arts, &c.

in London, distributed some of the seeds of the herd or timothy-grafs, and also of the fowl-grafs. which were recommended by the Rev. Dr. Elliot, upwards of twenty-five years ago. It is however no great fign of their fuccess, that we have never heard more mention made of them. This must always be the fate of foreign plants, when competing with the native productions of the foil, where earth, and air, and climate are more congenial to them. To sometroperis of them to a . I

There is, however, another trial of the fame kind, now made, or making, to introduce a new American grafs, which is faid to unite the two genera of the cormicopia and alopecurus. It bears a long verticillate paniele, and ripens its feed about the middle of August. It is equally patient of excellive heat or cold. It propagates by root and joint, as well as by feed: It is perfectly tender and free from fpines, down, or hair: it is always in a verdant state: and either in the way of pasture or meadow, we are affired, that it promifes to exceed every denomination of gramen in every climate. The trans the character and

In fhort, we are told by Mr. Frafer, of Chelfea, that this extraordinary grafs actually attains a higher degree of perfection in this country, than it does in its native foil of North America.

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at the same proper region of the best of HERE is no branch of agriculture which is of greater importance, or that prefents a larger field for improvement, than the proper management of lands in pasturage. The good or bad state of those lands affects all the animals with which we are most intimately connected. and confequently it very materially affects ourfelves, through that medium. It is obvious, that the health and good condition of the farmer's horses, cows, sheep, and hogs, depend very much upon his attention and care, not only to keep his pastures in a productive state, but also to keep them clear from weeds and plants of a noxious quality, and to substitute those which are wholefome, falutary, and medicinal

The celebrated Linnæus relates a circumstance which happened to him in his Dalekarlian journey, and which forcibly proves the utility, or rather, indeed, the necessity of a thorough attention to this subject. When he arrived at Tornea,

the inhabitants complained to him, of a terrible disease that raged among the horned cattle, which died by hundreds, foon after their being turned into their fpring pastures. They requested Linnæus to confider this affair, and give them his opinion.

This great man observed, with his usual fagacity, That the cattle died, as foon as they left off their winter fodder, and returned to grazing. That the disease diminished as the summer advanced. That in the fpring, the cows were driven into a meadow near the city, and that they chiefly died there. That their bellies swelled, they were feized with convultions, and in a few days expired with dreadful bellowings. That no man dared to flay the recent carcaffes, for their hands and faces swelled, were inflamed, and even mortified, and that death had fometimes enfued.

These and other circumstances, made Linnæus fuspect poison; and as he passed over the river in a boat, he there beheld the long leaved water hemlock, which the beafts, greedy of green food, had devoured in the fpring, when little else prefented itself; but declined eating it, as the seafon advanced, and thus the disease diminished. He faw no more of this plant, till he came to the vast meadows near Limmengen, when he again found it along the road; and when he entered lefferred .

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that town, he heard the same complaints as at Tornea, the transferd grown over that the same

I have given this account the more at large, because I could not have produced a stronger instance of the necessity of carefully adverting to the plants which prevail in pastures.

On inspecting pasture and meadow-lands, in general, many noxious and poisonous plants will be found, and sometimes in considerable quantities. Of these kinds are, among others, henbane, hemlock, the aconite, or deadly night-shade, and several species of dropwort, which, if taken in by cows, with their food, &c. will generally cause disease, and sometimes death.

It may be alleged, that inflinct is a certain guide to almost every species of animals, in the choice of their food. This is generally, but not unexceptionably, true. If cattle were at liberty to range over extensive tracts of pasturage, with a plenty always before them to choose out of, there would be little danger; but when herds of them are confined within narrow inclosures, where such noxious plants abound, and kept there till little that is green remains, it is almost impossible but that some of the cattle must be disagreeably affected by such plants, when they are caten.

of these and other noxious plants, the danger is

leffened; and a confiderable advantage will be derived from fuch lands being, by fuch means, rendered capable of producing a larger quantity of wholesome herbage.

All neat beafts have a natural tendency to fcouring and flatulent diforders. It is therefore a duty of the greatest importance to the farmer, to
fow and plant in his pastures and hedges such
herbs, in proper quantities, as are found to be
the best remedies for these and such other complaints as cattle are most incident to. Among
many that might be mentioned, the following
herbs are very falutary; lovage, agrimony, carraway, and cummin.

The health and lives of people residing in the country, are in some measure dependent on the health and good condition of milch-cows; milk being a vegetable juice, partaking more or less of the good or bad qualities of the plants on which cows feed.

which cows feed.

Milk, and its produce in cream, butter, cheefe, and many of our luxuries, are constituent parts of our daily food, from the earliest to the last stage in life; consequently great care ought to be taken, with respect to the food of animals, who surnish us with so great and so necessary a part of our sustenance.

The skilful and attentive agriculturist cannot Gg 4 therefore

therefore be employed in any purfuit that tends more to the interest and health of mankind, than the increasing the quantity, and improving the quality of cows milk. The task will be arduous, but the reward will be ample.

That cows are frequently diseased, is a well known fact: and it is also well known, that their diseases generally proceed from unknown causes. Few dairies of cows remain a whole summer healthy. Five out of thirteen have been known to die in one season; and the most noted Cow-Leaches could not discover, or even guess at the disease, or its cause.

There is much reason to believe, that the milk of diseased cows is too often mixed with the rest, and made into butter, cheese, &c. If then it appears, that cows are diseased, and die annually, without the nature or cause of the distemper being discovered, and of distempers to which this species of animals are not naturally subject, it is to be presumed the most reasonable way is, to search for these causes in their food.\*

Many excellent meadows and pastures are so over-run with bushes, shrubs, weeds, mole-hills, ant-hills, and the like, that a great part of them is oftentimes wholly lost, and a considerable por-

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tion of the remainder cannot be mowed but in patches, to the manifest detriment of the husbandman, whose first care in that case, should be the removing of these obstacles.

I have already mentioned Mr. Platt's very good and eafy directions for grubbing up shrubs and bushes, by means of a large and strong dungfork.

The Rev. Dr. Elliot advises, from his own experience, when any bushy growth is to be extirpated by cutting it down, always to choose for this business a cloudy day, in June, July, and August; because the stumps will bleed more freely at such a time, and consequently will die sooner, than when the hot rays of the sun shine upon them and dry up the sap. For the same reason, a sharp implement used in cutting is preferable to a blunt one, as it leaves the mouths of the tubes more open, to allow the sap to flow plentifully.

Trash thus rooted up or cut down, but the former is the best, should afterwards be burnt, in the manner before directed: and their ashes will be of great service to the ground, if spread upon it before the autumnal rains.

The best way to manage mole-hills and anthills is, to remove their contents in a small cart or wheel-barrow to a convenient part of the field, and to mix them well with hot lime, or, failing that, with hot wood-ashes, or soap-ashes. This compost will make an excellent dressing for the field after it has lain some time, and should them be spread over the surface of the ground. The spots on which the mole or ant-hills stood, should be loosened with a spade, then dressed with the above compost, and laid down with clean grass seeds. Thus, a sine grass will be raised in those places, instead of the coarse benty growth, which occupied them before.

The general produce of ant-hills has often been, through mistake, supposed to be wild thyme; and as this herb is salutary in its nature, farmers have suffered those hills to remain in their pastures, from an idea that they surnished a medicinal repast to their sheep and cattle. But on a careful examination any one may be convinced, that in general the produce of ant-hills is, a little of the wild thyme, seldom touched by cattle, and a much larger quantity of poor, small, rushy, sour grass, which is a pernicious kind of food both for cows and sheep.

Draining of pasture land is likewise a vast improvement: for though meadows and pastures, which are capable of being overflowed, produce a greater quantity of herbage than dry soils; yet where the wet lies too long and stagnates on the ground,

ground, it chills and fours it, and the grass will become rank and extremely coarse. If care be not taken to drain such land, the grass will diminish by degrees, and will be succeeded by rushes and stags, and be reduced to little value. The soil most liable to this is, cold stiff clay, where the water cannot penetrate, so that the wet it receives in winter continues till exhaled by the heat of the sun.

The best manner of draining these lands is, by doing what I have already directed for arable lands, which is, to draw deep surrows with the plough across those places where the water is apt to lodge, and afterwards to scour and deepen them with a spade. These must be made to communicate with larger drains, or ditches, which should then convey the collected water to a stream, pond, or lake. If no such receptable is within reach, ditches or tanks must be dug to receive the water, and the earth dug out of them should be mixed with lime or matte, and spread on the land: making thus a virtue of necessity.

Meadows or pastures which lie flat, and whose furface consists of loose earth, that affords an easy passage to water, whilst a stiff soil underneath retains it, are apt to grow sour and cold by means of this excess of moisture. For these, the underground drains before directed are the most proper.

proper. Or, to mention one more, which is the most simple of all, because it requires no materials but those which the drain itself furnishes: Let a labourer slide off a fod or turf from the top of the proposed drain, a little wider than his spade: this sod or turf must be cut of a wedge form, the upper or grass side being the narrowest; this is eafily done by the labourer's sloping his fpade in cutting the fides. This turf is taken off in lengths of a foot or eighteen inches, and laid on one fide of the drain. The spade is then employed to take out one spade-full more of mould under the turf; a narrow spade is employed to take out another depth of mould under the former; and laftly, a fcoop is employed, a little narrower than the fecond spade; and thus we have a drain diminishing from top to bottom. Take then the turf, and, turning it upfide down, let it into the drain as far as it will go, rather pressing it down so as to form like a keystone between the two fides of the drain; as it will not and cannot go to the bottom, it will leave a cavity underneath, for the water course, and the mould may be replaced over it, and fprinkled with grass feeds. Such a drain will last ten, twelve, or twenty years, and may be made for a halfpenny a yardi

When these precautions have been taken, and

the above mentioned obstacles removed, the ground must be cleared from every plant which is not intended to make a part of the pasture; for it is extreme bad husbandry, to suffer such plants to grow on land, as should not be eaten, or, if eaten, will injure the farmer's interest by hurting his cattle. It must be great negligence or indolence to suffer pasture-lands to remain over-run with hemlock, thistles, docks, rushes, &c. and the hedges and ditches to be filled with poisonous plants, and the nettles, thistles, &c. to remain on the sides of the roads till their seeds ripen and are carried by the winds into all the adjacent fields.

At the same time there are several plants, which, however improper or hurtful they may be in meadows and in pastures, yet are not only useful, but even profitable, when in their proper places. Some of the principal ones I shall mention here. 1. Furze, whins, or gorse, the genista spinosa of C. Bauhin, and the ulex of Linnæus. These propagate themselves most rapidly by the feed, which is thrown from the pod by an elaftic jerk, by which means it foon foreads itself all around, to a confiderable distance. Where these ought to be removed, I have already mentioned the most effectual way of accomplishing this bufiness; but when unnecessary to remove them, Janet)

them, they will be found of utility, particularly in sheep walks, where they afford shelter in the winter! besides, they shed agreat quantity of their thorny leaves, which manure the foil. They also afford some food for sheep in winter, and may be cultivated to advantage on fands, that are otherwise barren.

French furze leed fown on the fides of the little fand-hills in Norfolk about forty years ago, first gave rife to many improvements there; for they succeeded so well, and grew so fast, that once in three or four years they were cut for suel, and fold well at Thetford, Brandon, Harling, Swafham, and places adjacent. This first excited the gentlemen in that neighbourhood to extend their ideas to other plantations, in which, by the judicious mixture of marle and clay with their fands, they succeeded amazingly.

Where there are moveable fands, which are fornetimes transported by the winds over the adjacent fields, the fowing of French furze might most probably be found a cheap and effectual remedy.

The tops of the common English furze, when bruifed a little to as to blunt their prickly points, have proved excellent fodder even to lean fickly beatls, and particularly to horses, which they have frequently recovered and plumped up in a short

fhort time. This custom is much practifed in feveral foreign countries, where furze are cultivated purposely for fodder, and the peasant thinks himself fortunate, that by breaking their spikes with a mallet, he is enabled to give his cattle wholesome green food in the winter, when no other plant can be had fit for that use. It is said, that Sir Capel Hanbury created mills in Wales, many years ago, for bruising surge.

When furze are raifed for the food of cattle, especially on foils like the above mentioned, their seeds should be sown in February, March, or April, and the ground should be prepared as for barley. Six pounds will be sufficient for an acre, and they should be but barely covered.

The young plants must be preserved from cattle during the first year, and they will be set to mow or cut in the next. October is the proper time for cutting them. They will continue to shoot till Christmas, and be fit for use till March. Horses cat them as readily as they do key, after they have been bruised, and it is said, that an acre of land will produce fifteen tons of this fodder, and that it will go as far as an equal quantity of hay. Some mix the bruised surre with chopped straw, an hundred of straw to a ton of surre; but only the growth of the year should be cut for cattle.

be fides

Poor, hungry, I may fay, barren foils, that would not have let for a shilling an acre, have been made worth twenty shillings a year by fowing them with furze feed, in places where fuel has been scarce; this being used for heating ovens, burning lime and bricks, and also for drying malt. This shews, that the poorest foil may be made profitable by industry and attention.

It was formerly a practice to plant furze for hedges; but these were soon exploded, for they grew naked at bottom, and spread themselves over too much ground.

The Marquis of Turbilly observes, that cows, oxen, and most other cattle, as well as horses, seed heartily upon, and are well fed by the bruised furze; and that we may be sure corn will do well wherever this plant is met with.

The flowers of furze are excellent for bees.

Broom (genista), if considered as a weed, is one of the most pernicious plants that grows upon land, because it sheds no leaves, but continually exhausts the goodness of the soil. To destroy it on pasture land, the best way is, to cut it up in May, when it is sullest of sap; because the roots will thus be killed; whereas in pulling it up, part of them are apt to be lest behind, and the least bit will produce a new plant. Foddering of cattle on the land, will likewise destroy this growth; for besides

besides their urine, their treading upon it and upon the foil which is hardened thereby, helps to kill it also got did out sail , also but about

The twigs of broom, but especially those of the Spanish (genista bispanica) which are the long-est, make good baskets, are used for binding, and for making of dry hedges, and are also excellent for thatching; being very tough and of long duration. Ropes, likewise, and those not bad ones, for barges and other small crast, are made of the stringy sibres of this plant, of which the ancients used to make a kind of slave.

Mr. Bradley has calculated, that an acre of broom, is worth upwards of fix pounds for the feeding of bees only, besides the wyths and stumps, which will pay for the rent of the land. Certain it is, that no slowers are more pleasing, or more profitable to bees, than those of this plant, and especially of the species called the Spanish broom.

The other uses of broom are, that besides yielding some food for sheep in winter, it also affords some shelter, in that inclement season, as well as from the hear of the sun in the summer. They burn also into excellent ashes, richly impregnated with salts.

3. Fern (filix) is one of the worst of weeds, and one of the most difficult to destroy, where it Vot. II. Hh has

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has deep foil to root in. Mr. Mortimer fays, he has feen its mosts eight feet deep in some grounds, and adds, that the best way of killing it is, by cutting it often while it is in grass, particularly in the spring, at Midsummer, and Michaelmas, when the circulation of the sap is strongest. The subes will them bleed to death, or if the sap stagnates in them, the roots will soon rotal.

The fern out, when full of fap, in the beginning of autumn, will make a most admirable ingredient in a mixen; because no plant yields a greater quantity of alkaline sale. For this reason too, it burns to great advantage, for making of pot or pearl ashes. The poor people in Scotland and Wales, sensible of this quality in fern ashes, make them up into balls with water, dry them in the sate, and use them for washing their linen, for which they think them nearly as good as soappeals.

Trees planted among fern will thrive very much, though it be on a hot gravel, the fern shading their roots, and keeping them moist and cools and tapanage and the property and cools and tapanage and the property and the same an

Worinwood (absinibium) though a rank weed in pastures, yields likewise a considerable quantity of fixed alkaline salt, which is much used for medicinal purposes. It is said to be very effectual in restoring pricked or sour wines.

5. Reeds,

5. Reeds, rushes, stags, and such like aquatics, are best destroyed by draining. If the drains are out deeper than their roots, their nourishment is cut off from them. A compost of hot lime, soapasses and soot will likewise kill them, and so will plowing them up and laying the land up in high ridges to drain; or moving them very early while the sap is in them; but if hay be made of this growth, it should not be dried too much; because, that will increase its coarseness. Plants of this kind always indicate a good soil; for a bad one will not nourish them, especially reeds, the chief use of which is for thatching and making small sences in gardens; &c.

Quantities of weeds, are frequently introduced into pasture-grounds, by the ill husbandry of farmers, who, in hard winters and very dry summers, feed their cattle there, with foul straw, hay, haulm, vetches, &c. intermixed with the weeds themselves, or their feeds.

After the field is cleared of weeds, and the grafs withered in autumn, is the proper time to enrich the land with fuitable manures. The advantage which pastures receive from manures spread upon the surface of the ground, arises, as I have mentioned with regard to meadows, from the rich particles of these manures being washed down through the earth to the roots of the plants.

What

What I have faid, therefore, upon this subject in treating of meadows, applies equally to passures, both with regard to manures and the use of the scarificator, for their more easy admission.

The shelly fand on many parts of our sea-coast, which I have before mentioned so much at large, small gritty gravel, road-drift, lime-rubbish, the chopping of chalk or lime-stones, are all excellent manures for cold clayey pastures.

Marle is the greatest improver of sandy soils, particularly the shell marle; for, being easily distifulved, it readily enters and enriches the ground. It is therefore a treasure wherever it is found: for it will supply the place of almost every other manure.

Where better manures cannot eafily be come at, burnt clay is a good resource for such lands; for this purpose, dig a quantity of clay, suppose six or eight loads, to begin with, in spits about as big as common bricks. The best time for doing this is in the dry weather of summer; though the burning place should be as much as possible in the shade, where it will burn better. Make a pyramid, as if for a bon-sire, of sern, straw, surze, brush-wood, saggots, billets, coals, or other combustibles, and around this, lay your pieces of clay, two or three spits thick, till the whole pile is inclosed, excepting only a hole in the

the fide, to light it at, and another at the top to make a draught. When the fire is well kindled, and the furrounding clay begins to be thoroughly heated, stop up these holes with clay, and continue to add, as before, more spits of the same, placed in such order, that the sire may be pent up within the heap, and never suffered to go out; for if that should happen, the work must begin again.

After that the first fix or eight loads of this dryish clay are burnt, the heat within the heap will be fo intense, that even damp clay, brought immediately from the pit, may be laid on without danger of extinguishing the fire, if it be not piled up too quick, or in very great quantities. Six or feven hundred loads are faid to have been fometimes burnt in one heap in this manner: but then it has rifer too high to throw the day up to the cop of it, from the level of the ground. A kind of stage is therefore built in this case, and the spits of clay are wheeled up and thrown from thence on the heap. The pile must be tended night and day, till it is incircly burns out. The price for burning is a halfpenny, a buffel heaped measure.

covering them with gravel. If the foil be natutally slopfe, clay may be mixed with the gravel: but if it be pretty strong, clean gravel is best. The earth by degrees loses its marshy appearance, and the gravel seems to give warmth to the soils to that the moissure evaporates in our nost housed

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precaution should be used in preparing it, as I have before recommended for meadows.

There are in this kingdom, wast tracts of land, known by the name of Downs, on which are fed large flocks of sheep. Experience has proved that though the grafs there is naturally short, it is remarkably (weet, and an excellent food for theorem, and as the welfare of these cocatures is of the utmost consequence to one of the most effent tial branches of surmanufactures, very great can in their food, will it be clearly evinced by expension in their food, will it be clearly evinced by expensionent, that better pastures does not injure their fleets. Late our believes does not injure their fleets.

I have already observed, that hurner is said to improve the wool of sheep, but very ample and latisfactory experiments are still wanting to establish this fact.

Down's in general are of a louis, fandy, dry folly covered within very thin coat of mould, on which the grafs grows: In ymany places, is bed

of gravel is from met with, and in others chalk. Where fand or gravel is the foil, the owner of fuch land has generally in his power an easy mode of improving it in fuch foils being hardly ever without marle, or a rich earth, underneath them. at a greater or less depth; A borer, to find out this carth, and a dreffing of it when found, are all that is here wanted but the dreffing thould be light and frequently repeated. Where the bottom is chalk with a thin covering of earth, the challe strewed shinly on the surface is a good and cheap dreffing: this, with the dung and stale of the theep, will keep the land in wonderful good orders and fuch foils are perhaps better and more profitably employed as downs, than they would be if otherwise cultivated; and forely there are fufficient improvements yet to be accomplished, all over Great Britain without encroaching on these excellent and aseful pastures to some of

Whatever manutes are laid upon pattures, it will be of great utility to roll the ground well in the follow, and afterwards to pick up and carry off all flones, fragments, and other rubbils left on the ground and unbarried by the roller. Farmers cannot be too careful in preventing the treading of cattle on their patture lands when wet in a product and when

ne The nocessay of waters in all pastures is selfmodes a Hh 4 vident;

evident as cattle cannot live without it and the driving them farilis not only expensive but great loss of time, and projudicial to the health of the beafts themselves, particularly in hot wear ther. This is for fentibly felt in many parts of England, that people have been obliged to dig wells, even to fuch a depth as frequently to require the affiftance of horses to draw the water. The means of rendering it eafily come at) must therefore enhance the value of the land, where it can be fo procured, and are of very effential confequence to the hufbandman and : prifferb ened

Where the furface of the ground is fand or gravel there is feldom occasion to dig deep for water; because such soils lie generally on marle, or fome other rich earth, through which the water eannot defeend. Wherever water flaguates in fuch foils, the farmer lees at once, at what depth is the furface of the earth which retains it. But in other folls and when this does not happen, he must have recourse to the following directions, how to fearth for it with the greatest probability off all flones, fragments, and other rustabbut to

Where ruthes, reeds, flags, willows, or other aquatic plants grow spontaneously, or where frogs lie fquatted down to the ground, to receive its moisture; there is generally water underneath. It is an infallible figh of fubterraneous water, when vident :

Hh a

a vapour

a vapour is feen to arise from the same spot of ground. Or where fwarms of little flies are feen in the same place, and near to the ground, in the morning after fun-rife. Or let a man, before funrife, lie down flat on his belly, resting his chin on his fift placed close to the ground, and looking horizontally and stedfastly to the east. If the then fees a tremulous vapour arife from any particular fpot, let him mark the place, and water will be found underneath: but this experiment will only hold good on ground which is dry. Or dig a hole three feet fquare and five feet deep, at funfet, place a pan or bason, rubbed with oil on the infide, at the bottom of the hole, and turn the pan upfide down; cover it with dry hay, or fern, or fraw, and over that with earth; and if any drops of water are found flanding on its infide next day, a spring is not far off. Or if wool be left all night in a trench of this kind, and water can be foucezed out of it the next day this too is a ftrong fign of water being near of I shall hereafter have occasion to mention a method for making of artificial fprings of water, jos willing

The month of August is generally looked upon as the most proper time to search for water.

Wherever water is found, the next concern is, the way of preferving it, and of coming early at it. In clayey foils, ponds, for retaining it, may be be formed with facility; but in loofe foils, other means must be used. For this purpose, mark out a circular piece of ground, whose diameter is twenty yards, more or less, and dig out a foot of earth so as to leave the sides that depth perpendicular. Then begin to form it in the shape of a milk bowl, till the perpendicular depth in the center be; four and a half or five seet. On the bottom and sides spread lime sinely powdered two or three inches thick. On this lay the toughest and stiffest clay that can be found, spreading it over the lime, as it was placed in its natural bed, to the thickness of six or eight inches. This clay must be well bear down with wooden rammers, such as paviors use.

If the clay be put on in two layers, and treated fo, it is better; than in one. Upon the clay thus prepared lay gravel or small chalkstones, six inches thick. The gravel should have both the siner and coarser parts screened from it. No spore clay should be prepared for the gravel, than can be convered the same day; because heat or frost with be equally apt to catch it, which must be oparticularly guarded against, as it would make the pond lose its water.

A piece of ground should be chosen, to which there is a descent from all sides, if it can be found convenietly situated. Winter, or early in spring,

fpring, are the best scasons for making these ponds, and each material, should be of equal thickness; from the middle to the edge. The less water is used in slacking the lime, the better it will be no

Salt marshes are generally very rich land, but they most commonly lie so flat, that it is need-fary for the owner to keep all the water he can from them. These lands fatten all forts of partie the soonest of any, and preserve sheep most effectually from the rot: nay, if a sheep is rainted, and fent to the marshes, the rot will proceed any farmer has been known to drive his sheep into the sea, and to make them swallow seal matter, which he found to have the same effect as seed ingon the salt marshes.

of feed his cattle with fuch coarse hay as they are not fond of he will do well to mix salts with it in the proportion of two pound to one burided weights of this will quicken their appetite, and may be the means of preserving their health-ide.

The American black grass has been mentioned as a plant which had greatly improved their salt marshes in that country. The feeds of it were in consequence sent for from New Englands but whether they were tried or with what success. I have not been able to learn. Tomos and to own book A

If ever the Spanish plant named Kali, from which barilla is made, were cultivated with success in this country, I am persuaded it must be on marshes recovered from the sea, and from whence it is excluded by embankments.

Small dairy, or grafs farms, in the neighbourhood of great towns, are certainly more profitable than fmall arable ones. This the landlord knows in for he has always his rent better and more regularly paid from the former, But the advocates for the plough will plead, that the abuseros any thing ought not to be confounded with ats Ireal excellenceque The generality of court farmers are most certainly egregious flovens; for lands devoted to the plough, and finuated like the former, may be turned to great account. The produce of artificial graffes alone, on fuch land, may be made incredibly great and every profitable. The fraw yard is a most convenient place footherow, when freed from the pail ; and in the winter something more is required than hay, and that fomething is cabbages and roots, which are the produce of the The American black grafs has been andgoold

A good

A good dairy maid in Norfolk is reckoned fufficient to take proper care of twenty cows, and one hog is the allowance to each cow.

Much depends on the choice of cows, and the care taken to mend their breed, and increase their milk. Cows of a red and black colour are preferable to white; of which last, not more than one should be admitted into a dairy. But Mr. Bakewell, who is famous for his breed of cattle, seems, by Mr. Young's account, to give the preference to pale coloured ones, as an indication of siner sless. Heisers intended for breeding, should not be bulled till the fourth year. The third, sourth, and sifth calves are the most robust, and of course the best to breed from. A bull should be well fed, and kept from coition till the second, if not till the third year. His vigor lasts only for two years.

In the choice of cows to breed from, fee that they have eight or ten white teeth in their jaw, that the breast be broad, the tail long, the veins of the belly distinguishable, the brace of the navel large, a broad forehead, large black eyes, wide nostrils and ears.

The feeds most esteemed for promoting an increase of milk, are those of tresoil, salusion, angulica, pimpernel, cummin, and annise. About the walls of houses, and on the insides of hedges, lovage should be sown.

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floodd be adawired into a dairy. But Mr. Baker

THE enclosing of lands, and subdividing them into different fields, &c. is a most effential part of their improvement, and is attended with many real advantages, of which I shall here mention a few.

Enclosures ascertain to every man his just and due property, and thereby prevent an infinity of trespasses, injuries, the depredations of neighbours cattle, and other fources of ruinous litigation. They keep the land warm, and add to its fertility, by screening it from violent and nipping winds, which otherwise frequently destroy whole crops and they also defend it from those drying and scorching winds, which so often blast at once the husbandman's expectations. They afford shade in summer, and shelter in winter, for cattle which would otherwise destroy more with their feet, than they would eat with their mouths; and which, for want of these, might, as Mr. Worlidge observes, lose more of their flesh in one fultry day,

SECTION

day, than they would gain in three cool ones. Their cuttings afford fuel to the industrious hufbandman, and, if carefully planted and preserved, they will even furnish him with timber for his carts, ploughs, and other implements; sometimes, perhaps, with useful fruits. They are a great encouragement to neat and clean husbandry, and by protecting, increase the crops. For it has been generally remarked, that well enclosed countries not only maintain treble the number of inhabitants that the open ones do; but also, that these inhabitants are much better fed and clad, than the generality of those inhabiting unenclosed countries.

The common objections against enclosures have been so well refuted by many able writers, and are daily invalidated by experience, that it would be idle to recapitulate them here. I shall therefore only mention one more essential advantage, that it enables the farmer to act as is most agreeable to him in sowing when and what he pleases.

Every gentleman whose estate is not yet enclosed, and who is consequently at liberty to choose the manner and means of doing it, will naturally begin with having it surveyed and planned, that he may be thereby enabled to have it divided and portioned out, with propriety and precision, so as to render it most beautiful, and most most convenient. If he has a place of residence upon it, he may make the whole become an ornament to that residence, by a judicious and skilful disposition of his plantations, hedges, and farm houses. The farms should be so divided, that the dwelling of each tenant may be as centrical in his fields as conveniency will admit of; to prevent length of carriage, and to facilitate his own attendance.

Farms of a midling fize, have always been obferved to yield the greatest proportional rent, and middle fized enclosures constantly produce the most plentiful crops.

Enclosures for arable land should be larger than for passures; that the foil may be kept dry, and the corn be well aired: for this will contribute greatly to prevent mildew, and other distempers arising from too much moisture, and want of air.

As forest trees, by their shade and wide extended roots, are found to be evidently injurious both to corn and grass, sew of them should ever be admitted into the hedges which divide sields, and those sew should be planted with judgment, so as to do as little harm as possible. But as forest trees are useful, and even necessary, for a variety of purposes, as well as for warmth and ornament; the landlord should dispose of them in plantations,

plantations, on such lands as are suitable to the nature of the trees, where they can do no injury, and where the lands cannot be otherwise occupied to such advantage: and of such lands, and of such plantations, with the profits accruing from them, I have before taken particular notice.

In countries where, in lieu of hedges, the fences are made of rough stones, piled dry upon one another, with a row or two of fods at top, to keep them together, it would be well judged to carry them through the middle of plantations where they would be most out of sight; because, however useful, they are but disagreeable objects.

The most usual way of inclosing land in this country is, with a ditch and bank set with a hedge of hawthorn, crabs, black-thorn, holly, or, which is still more common, of white-thorn, or quick. In planting such hedges, attention should be paid to the nature of the soil where they are to be placed; so that aquatics may be planted in moist soils, and on dry ones plants that are suitable.

Mr. Miller recommends the white and the black-thorns and the crab for outward fences, but does not approve of intermixing them. The white-thorn, he thinks, is the best quick, because most easily procured, is very hardy and durable, and may be rendered the closest of any fence,

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by proper clipping: it will thrive on any well loofened foil, except very dry gravel or fand.

The holly makes an excellent fence, and is preferable to every other plant; but is difficult to be made to grow at first, and grows slowly. However, when it is up, it makes amends by its height, strength, and thickness. It delights most in strong grounds; but will grow upon the driest gravel, even among rocks and stones. It is raised from sets or berries, like the white-thorn, and are both best sown in the place where they are intended to stand,

They should be kept well weeded till they acquire height and strength.

Alder planted on a bank, the fide of which is washed with a river or stream, will make an extraordinary sence, and preserve the bank from being undermined by the water; because it is continually putting forth from the lower roots, suckers which are of great advantage where the current washes away the earth.

Sticks of elder, ten or twelve feet long, stuck floping in a bank, so as to form a kind of lozenged checquer work, will produce the quickest, though not the strongest hedge, of any thing, and will be a good shelter.

Ditches should be at least fix feet wide at top, three feet deep, and one foot and a half wide at bottom, bottom, that each fide may have a proper slope, to prevent its sliding down.

Besides the above plants for hedges, the sweet-brier or eglantine (dog-rose) is much recommended by a correspondent of the Society of Improvers in the Knowledge of Agriculture in Scotland, who planted them in the following manner. After marking out his ditch, he laid his plants about eighteen inches asunder on the side grass, and covered their roots with the first turs, taken off the surface of the intended ditch. The earth side of the turs was placed next to the roots, and over the turs was laid the other earth from the ditch. In sour or sive years these plants made a sence, which no sheep, cattle, or horses, could pass.

Old briers taken up and divided, make excellent plants, and where the fences are too thin, they may eafily be thickened by laying down branches, which make shoots of fix or seven seet in a year; and this plant bears clipping extremely well. These hedges are beautiful when in slower, and always smell sweet.

In the hedges which divide the fields of the farm, fruit trees may be planted: these too are beautiful in the blossoming season: besides, they yield a profit as well as ornament: or fruits may be grafted on stocks in the hedge, properly suited

thereto; and the only objection to this is, the temptation thereby thrown in the way of idle people, to break over and spoil the sences, in order to come at the fruit. On the other hand it is alleged, if that fruit be only fit for cycler, it will be so four and uneatable, that no body will ever give themselves the trouble of coming after it.

Fences made in marshy grounds, require plants which delight in moist soils. Of this kind are particularly the black alder, the willow, and the poplar: the birch and the ash will also thrive very well in fuch places: but the alder is reckoned the best and most profitable. It likes a foil so moist as few other trees will thrive in, and is propagated either by layers, or truncheons about three feet long. The best time for planting these last is in February, or the beginning of March, when they should be sharpened at their larger end, and a hole made with an iron crow, or fome fuch utenfil, large enough to allow them to be thrust in without stripping off the bark, which might occasion their misgiving. They should be set at least two feet deep, to prevent their being blown down by violent winds, and should be kept clear of weeds till they get out of their reach.

If alders are raised by laying down the branches, this should be done in October, and by the same time twelvemonth, they will have roots suf-

a Olemen's

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ficient to be transplanted, which must be done by digging a hole, and loosening the earth in the place where each plant is to stand. The young sets should be planted a foot and a half deep, and their tops should be cut off to within nine inches of the ground, which will make them shoot out many branches.

The alder may be trained into very thick, close hedges, to the height of twenty feet and upwards. It may be cut for hop-poles every fifth or fixth year: it makes excellent pipes and staves, for it lasts a long time under ground or in water: it is also much esteemed by turners, plough-wrights, &c. and for making several utenfils in agriculture. Its bark yields a good black dye.

Mr. Miller enumerates fourteen different forts of willows, which grow best in moist soils, and may be easily propagated by planting cuttings, or sets, either in spring or autumn: for these readily take root, and are of quick growth. These will afford very profitable loppings every fifth or sixth year.

The middle fized, or long leaved red willow is that which is cultivated in ofier grounds, for bafket makers. They are cut every year, and fometimes bring fifteen pounds an acre; but ten pounds is a common price. These willows would therefore be profitable on boggy land, where sew

other things will thrive. Great care should be taken to screen them from cattle. Hoops for barrels are sometimes made of them. The large wood, if sound, is used for wooden heels of shoes, and for many kinds of light turnery ware.

The poplar may be propagated either from layers or cuttings, which will readily take root; and also from the suckers which the white sort, commonly called the abele tree, sends up from its roots in great plenty. Truncheons of this tree, two or three seet long, may be treated as before directed for those of alder.

The black poplar is not so apt to take root from large truncheons; wherefore the better way with this is, to plant cuttings of a foot and a half long, put a foot deep in the ground. Mr. Miller says, he has planted cuttings of this tree, which in sour years have been bigger in the trunk than a man's thigh, and near twenty seet high; but this was in a very moist soil. Their leaves are said to be very good food for sheep.

The wood of the poplar, and especially of the abele, is much esteemed on account of its white-ness, is very good for laying sloors, where it will last many years; but being soft, is apt to take impressions. It is very proper for wainscotting, because it is less apt to swell or shrink than most other sorts of wood. For turnery ware, none is equal

equal to this, for whiteness and lightness. The bellows-makers prefer it for their use, as do shoemakers for heels. It is likewise very proper for light carts and for hop-poles, and its loppings afford good suel.

The birch tree will grow on almost any soil, be it ever so barren for other plants: it will thrive equally in moist springy land, or in dry gravel or fand, though the surface be very shallow. The birch is used by broom-makers, and is excellent for hoops, for some sorts of turnery ware, and some instruments of husbandry. It is used abroad for making wooden shoes. It makes good suel.

Birch trees are sometimes tapped in the spring, and the sap is drawn out to make a wine, which has been recommended for the stone and gravel. This, when well made, is the best tasted of all the artificial wines. The bark of this tree is almost incorruptible. Many houses in Sweden are covered with it, and it lasts many years. The bark often outlives the body of the tree, and remains sound when the wood is rotten.

The best way of propagating ash trees is, to sow them on the spot where they are wanted; for they may be easily thinned, and those which remain will grow to a larger size than if they were transplanted. This tree, which is indeed very useful for many purposes, is of so exhausting a na-

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dom or never to be admitted into hedge-rows; for it robs every plant within reach of its roots. It is particularly inconvenient in pastures; for if cows eat of its leaves or shoots, all the butter that is made of their milk will be very rank. In dairy grounds, not an ash is suffered to grow.

Some people prefer elm for division hedges; for which purpose the best and quickest method of raising them is, when any trees are selled in the spring, to sow, as corn is sowed, the chips made in trimming or hewing them green, on a piece of ground newly plowed, after which harrow them in. Every chip, which has an eye, or bud-knot, or some bark on it, will immediately shoot, like the cuttings of potatoes; and the plants thus raised having no tap roots, but shooting their sibres horizontally, in the richest part of the soil, will be more safely and easily transplanted, than when raised from seeds, or in any other way.

For elm fences, the plants thus raifed have greatly the advantage of others; as five or fix, and frequently a greater number of stems, will arife from the same chip, and such plants when cut down within three inches of the ground, will multiply their side shoots in proportion, and make a hedge thicker, without running to maked wood,

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than by any other method yet practifed. If clipt for three or four years, they will be almost impenetrable.

Where rough flat stones are plentiful, as in most parts of Scotland, the northern counties of England, Cornwall, Devonshire, &c. they have an exceeding good way of draining their land, making their fences, and forming their plantations, all by the fame operation. Thus, at the distance of twenty, thirty, or forty feet, at pleafure, they fink two ditches, throwing the mould from both into the space between. But as the upright fides of these ditches would be apt to flide down, with the winter's frost, they face them with rough stones, pressing these stones well in towards the bank, and bedding them folid by means of the mould behind: they then cover them with turf or fods for coping, and plant a quick hedge immediately within the wall and upon the loofe mould thrown out of the ditch, where it grows apace: in the space between, is formed the plantation, where the young trees are placed very close at first, and are thinned by degrees, as they require room to extend in.

It is obvious, that where stones are not near at hand, the same fort of sence might be made by facing the upright side of the ditch with sodwork, instead of the stone wall above described.

This

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This would doubtless be a saving of expence; but would be much more subject to the danger of sliding in, especially if there was any run of water in the ditch, which would undermine the sodwork, and render it liable to be thrown down by frost, by which means, the quick on the inside of it, would be removed from its place, and make a breach in the line, which would both disfigure and injure the sence.

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Licensed paraetts, andouts over stain one own some soul some today, particular office property the equipment believes to him when persons are any. with dome. The tac speaked at followings the chery with rough thomes quality their flactes well year and introduced the factor of the section of the rown of the typical beauty, they then caver stade has polescone about he condition and cause bedge on undetend within the half and godin salator and provide bluber flood salatage. and the it greated epison with the store between the stream is principled and conduction opening of the color plined recorded who the care the case has beand a substitution of restors or elfor which are account. to recover at a capaliance and capable each as hand, the lame but of topic in the its and that decomplished tide of the discharged followers a militable of a distribution and to be the grady

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## ESSAY XII.

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## Of Farms, and of Farm-Houses.

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BESIDES the cheerfulness and salubrity of the situation, there are three other things which should be particularly attended to in the choice of an estate or sarm; these are, the air, the water, and the soil. This last is generally and deservedly a matter of very deliberate consideration; but interesting as the two sormer certainly ought to be, yet they are, for the most part, far less the objects of attention, than their real importance demands;

The air should be elastic, pure and temperate; the water plentiful, wholesome, and easily attainable; and the soil should be dry and fertile.

The knowledge of the healthiness of the air is, as Lord Bacon observes, discoverable rather by experiment, than by reason or conjecture.

To examine the moisture of the air, before a house

house is built, wool, or a sponge may be hung up in the place, and afterwards compared with some of the same, exposed in the same manner, and at the same time, in another place. According as they gain more or less in weight, the air is more or less humid.

The air is liable to greater alterations, from heat and cold, in some places than in others; and as that inequality is reckoned an enemy to health, the most equal should be preserved. This is easily determined by the thermometer, and by examining the situation of the place: for the intermixture of hills and valleys, however pleasing to the eye, is certainly no promoter of longevity; because of the variations of the weather.

Open places, and champaign countries, are thought to be healthy, where the foil is dry, not parched or fandy, where wild thyme and other aromatic plants grow spontaneously, and which is not naked, but interspersed with trees and shrubs for shade. Yet the change of air in travelling, after being accustomed to it, is healthy: whence many travellers have proved long lived; as, indeed, have also many, who have dwelt constantly in the same cottage. A ruddy complexion, clear white of the eye, quick hearing, and distinct voice, are set down by Palladius, as marks of the healthfulness

healthfulness of the place, where these predominate amongst its inhabitants.

The ancients were particularly attentive to the quality of the water, and the ease of coming at it. They advifed bringing into the farm house, the water of a spring which never dries up, or if there be no fuch fpring within the farm, to bring the nearest running water into it; or to dig for well-water, not of a bitter or brackish taste. If neither of these were to be found, they directed large cifterns to be provided for men, and ponds for collecting and retaining rain-water for cattle. They esteemed that water to be best for drinking, which had its fource in a hill: fpring, or wellwater from a rifing ground was deemed the next best: well-water in the bottom of a valley was reckoned suspicious; and marshy or fenny water, which creeps flowly on, was, by them, rightly looked upon as the worst of all.

That water is most wholesome, which has no mineral in it, is perfectly clear, deposits no slimy fediment, leaves no spots or incrustation when boiled in vessels of copper or brass, and which boils pulse in little time, which has no smell, and to use Palladio's expression, "the best tasted water, is that which has no taste."

Sir Thomas Elliot, in his Castle of Health, obferves, that rain water is the most subtile and pure pure of any; the next, that which issues out of a spring facing the east, and passes swiftly among great stones and rocks; and the third, is that of a clear river, which runs over hard stones and pebbles.

There are various means, says he, of trying which water is best; for instance, that which is of lightest weight; also that which produces least scum or froth when boiled; that which will be soonest hot. Or dip linen cloths in different waters, and lay them to dry, and the water which dries soonest is the best and most subtile.

As springs and well-water pass through beds of sand, gravel, or small stones, these clear it of all impurities, unless there be mixed with it, substances soluble in water. If any mineral be mixed with the water, it is unsit for the sarmer's use. If it be hard, it is unsit for washing and many culinary uses. This water gives the meat boiled in it, a red colour; but the hardest water may be rendered perfectly soft, and fit for any use, by mixing with it a small proportion of pot-ash, or other fixed alkaline salt, or for want of these, the ashes of burnt vegetables.

Animal and vegetable substances, mixed with stagnating water, putrify and taint that water. This taint is most effectually carried off by boiling, during which, the putrid particles evaporate;

and

and whatever else remains in it will subside when it is cold. It may also be much mended by having air forced through it by Dr. Hales's ventilator; or it may be corrected by mixing with it acids, such as vinegar, juice of sour fruits, a little oil of vitriol, or by throwing over the surface some powdered alum, the vitriolic acid of which will correct the putrid and volatile alkali therein, and its sine clay will carry down the other impurities.

When there is neither running, nor spring water, artificial springs may be made in the manner pointed out by Lord Bacon, who does not, indeed, say he had tried them himself, but they have been repeatedly tried since his time, and found to answer.

They are to be made upon a hanging ground, where there is a quick fall of rain water. A trench of a confiderable length should be dug three, four, or five feet deep in the ground, in the bottom of which a gutter stone should be laid the whole extent. This trough or gutter stone should be covered with brakes to a good thickness, and a body of sand should be laid over the brakes. After some showers of rain, the lower end of the gutter stone will run like a spring of water, and this will continue for a long time after the rain is over, "As if, says that great philosopher,

losopher, the water did multiply itself upon the air, by the help of the coldness and condens fation of the earth, and the consort of the first water."

A gentleman in France, whose mansion stood on a height, far from any water, was advised to make a long ditch, about a fathom deep, in the neighbouring higher grounds, and to fill it with sand: he did so, and it continued to bring a plentiful supply of water for all domestic purposes.

M. de la Hire observes, in the Memoirs of the Academy of Sciences, for the year 1703, that rain water, which has been purified by passing through clean fand, and is afterwards collected in fubterraneous refervoirs, will keep a long time without becoming putrid. He thinks this water the best that can be made use of, either for drinking or for other œconomical purposes, because it is not impregnated with any mineral, as fpring waters fometimes are. In confirmation of this fystem of M. de la Hire, we have the completest proof in the practice of the city of Venice, which is computed to contain upwards of two hundred thousand inhabitants, who, in that hot climate, where rain only falls in two feafons of the year, are supplied, by this excellent expedient, not only with water that is good for every purpose of life, but also in such plenty, that, upon inquiry, I never

I never could find there had been any fearcity of that useful element, within the memory of man.

A great part of the cellars or vaults under the Venetian houses, which from damp, are uninhabitable, are occupied by the refervoirs necesfary for containing this water in large quantities; and as I know of no country where there is not in fome places of it, a scarcity of good water, I shall be the more particular in describing the manner in which it is managed by the Venetians, and which I have examined on the spot. In the center of a large vault, a circular well is constructed either of stones or bricks, jointed and bedded, with a fandy loam. If this well be intended to contain a very large quantity of water, its diameter must be regulated accordingly, or where space is wanting, it may be funk below the floor of the vault, only taking care to build it fo as to exclude every supply of adventitious water, which is best accomplished by building with terrace or puzzolana. That part of the well, which rifes above the floor of the vault, and which is not subject to any adventitious supplies, is to be constructed as above directed.

The floor of the vault, should be laid with a small declivity from every fide towards the well in the center. At the end, or at both ends of the Vol. II. Kk vault,

vault, a femi-circular space is cut off by a wall, of the lame confiruction as that of the well above the level of the floor: these spaces, and indeed the whole of the vault excepting the well, are then to be filled with the cleanest and purest fand that can be procured, nearly up to the edge of the well, and into these semi-eircular spaces, the water from the roofs is to be conveyed by pipes. Here the water makes its first deposit of the filth which it brings from the roofs, and therefore this is kept in a feparate chamber that it may be more eafily cleaned by renewing the fand, which may be necessary every four or five years; whereas once in twenty years will fuffice for the intermediate space. The water is next filtrated through the adjoining femi-circular wall, and gets into the great body of land in the large division of the vault; from this it transudes into the circu-lar well in the center, where in passing through the circular wall, it gets its fourth and last filtration, and is drawn pure from the well. From the upper edge of the well there should be a waste pipe to carry off the superfluous water, when occation requires.

To these methods of obtaining plenty of good water, I shall here add the following easy way of correcting such as is neither clear nor sweet, ascertained by several experiments made by the Society

ciety of Arts, &c. in London. This is by mixing of clay with the water, in fuch quantity, that when the clay is dissolved, the hand immersed under the surface of the water, shall not be seen.

The clay subsiding carries down with it all imputitles, and in a manner burying them, prevents their communicating any bad taste or smell to the water, which hereby continues long clean and sweet. The clay may probably correct stagnant water, and thereby preserve in clear and good in dry seasons, and may thus prove very useful, where there is no running water; but if any bad taste or smell remain after using the clay, they may be carried off by one of the ventilators recommended for that purpose by the Rev. Dr. Hales.

The water thus fined down, in a cask or deep cistern, and the clear, pure part remaining at top, may be drawn off by a cyphon, or by cocks placed in the cask at different heights, so as to leave the mud or thick part at bottom.

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Thus.

The great and learned Dr. Mead, speaking of water which is of such constant service, not only for our drinks, but also in preparing of our meat and bread, that it may justly be said to be the vehicle of all our nourishment, observes, that when ever this happens to have other properties than are necessary to fit it for this purpose, it is no wonder if in its passage through the body, these make suitable impressions there.

The Romans had pleasure, as well as profit in view, when they bought or flocked a farm, and therefore they laid it down as a rule, that no degree of fertility should tempt a man to purchase in an unhealthy country; nor the pleafanteft fituation in a barren one. Buy not too haftily," faid the wife Cato, "but view again and again the purchase you intend to make for if it be a good one, the oftener you fee it the better it will please your Examine how the neighbouring inhabitants fare. Let the country it lies in be a good one; the ways to and from it good and the air temperate. "Let your land, hif you can

Thus, at Paris, where part of the city is supplied with water from Arcueil, which is fo full of flony particles, that even the pipes through which it runs, are in time incrusted and chooked up ; Dr. Lifter has observed that the inhabitants are more fubject to the stone in the bladder, than in most other places.

In like manner, let the gross particles, with which the water is faturated, be of any other nature, metallic, faline, &c. thefe, according to their various gravity, the capacity of the canals, and fuch like circumflances, will, when they come to circulate with the human body, be by the laws of motion, deposited in one part or other. So these mineral bodies, and nitrous falts, which abound in the flowy water of the Alps, do certainly enlarge and fuff the glands of the throat in those who drink them, that fearce any who live there, are exempted from this inconvethe vehicle of all our notatiliment, obtaves, that when somin

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choose your situation, be at the soot of a hill, facing the south, in a healthy place, where a sufficiency of labourers, of cattle, and of water may be had. Let it be near a slourishing town, the sea, or a navigable river; or border on a good, and well frequented road.\* Let the buildings on your ground be strong and substantial. Do not hastily condemn the methods of others. It is best to purchase from a good husbandman, and from a good improver.†

I will only here add, that the banks of rivers which run with a quick current on gravelly and fandy bottoms, are both agreeable and healthy, but if the bottoms are oozy, and the banks marshy, such situations ought to be avoided: if

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<sup>\*</sup> Good roads, canals, and navigable rivers, by diminishing the expence of carriage, put the remote parts of the country more nearly on a level with those in the neighbourhood of the town. They are upon that account, the greatest of all improvements. They encourage the cultivation of the remote, which must always be the most extensive circle of the country. They are advantageous to the town, by breaking down the monopoly of the country in its neighbourhood. They are advantageous even to that part of the country; for though they introduce some rival commodities into the old market, they open many new markets to its produce. Dr. Smith, on the Nature and Causes of the Wealth of Nations. Lib, I, c. 11.

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led thither not from choice, but necessity, build on the south side of the stream, because the warm southerly winds which promote putrefaction, and are the most frequent, blow the noxious vapours from your habitation; whereas the northerly winds which blow more seldom, blow stronger, check putrefaction, and speedily dispel the noxious vapours.

A dry and gravelly situation is greatly to be preferred, but gravel is not always to be trusted, for it is often impregnated with water, till drained. A great drain or sewer round the scite of a house, is therefore the proprietor's first necessary care: for that will not only earry away the moisture in the foil, but will also convey off the soul water used for the various domestic purposes.

The farm house should not be too large, because that creates unnecessary expence, but it ought to have some elegance, to give pleasure to its possessor; and as Columella adds, to allure the wife to take delight in it. It should be built on the most healthy spot in the farm, if possible, near its center, and commanding a view of its fields.

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of the contains; for though they harodies for each

<sup>†</sup> Notwithstanding the infinite number of books of architecture, I do not know of any one, which has treated of this subject with any degree of ability. I consider it as an useful field yet unoccupied;

The other buildings, or out-houses as they are called, should be proportioned to the produce of the land, and the live stock which it is capable of maintaining.

These out-houses, with a good large pond for watering of cattle, and the washing of horses, &c. must be arranged round the farm-yard, so as it may be roomy, and perfectly convenient; for this is a matter of much consequence to the husbandman.\*

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unoccupied; but the architect who attempts it, should be well informed in country affairs, ere he can insure success. A book on this subject should not only contain designs of the dwellinghouses, but also of the farm offices, or out-houses adjoining-

\* The materials to be employed in buildings of this kind, depend altogether upon the fituation. Stone, bricks, or wood, are the usual resources of the builder; but there is yet another material, hitherto little used, which I would recommend to the serious attention of those gentlemen and farmers who have outhouses to creek; that is, thin plates of wrought iron, which may be applied to timbers roughly framed of native woods, as a cover both for roofs and side-walls. These plates are light and lasting, and can be easily bent to any shape, or cut to any size; they are cheap, and may be preserved from rust by means of a varnish, of which I have here given the recipe; and which is at the same time of great utility for the preservation of timber, or deals exposed to the weather, as also for that of all the implements of husbandry.

Take of oil of tar and common black rosin, equal quantities, by weight: put them into an iron pot over a sire, till the rosin is melted: I have subjoined a list of the buildings necessary for a farm of five hundred acres of arable land, the largest quantity that any husbandman can undertake to cultivate well and to advantage: when he exceeds that quantity, he may cultivate it, but it will neither be well done by, nor will it do well by him.

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Praise an extensive farm, but cultivate a small one, says Virgil, and indeed this was a precept universally adopted by the ancient Romans, who laid it down as a rule that the farmer ought to be stronger than the sarm, for in the struggle that must arise between them, if the sarm be too strong for the sarmer, he must give way. That is, if the extent of his sarm be such, that he cannot bestow a

melted; for which purpole flir the contents from time to time:
to every twenty pounds of these materials, add one pound of
rough sulphur, or brimstone, which stir also, till the whole is
melted and incorporated. To these add the colour required, such
as Spanish-brown, red or yellow ochre, red or white lead, (or
any other colour you want) first ground sine with some of the oil,
and in such quantity, as to produce the shade that may be desired.
Then, let this be laid on with a painter's brush, as hot, and as
thin as possible. Some days after, when the first coat is dried,
give it a second.

+ Virg. Georg. Lib. II. 1. 412.

- Lucian

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due culture upon every part of it, he must become a very great loser thereby. Nec dubium fays Columella, quin minus reddat laxus ager, non recte cultus, quam angustus eximie. Certain it is, that a large farm ill cultivated, will produce lefs, than a fmall one cultivated to perfection.

An infatuated rage for large farms, feems now equally prevalent with the land-owner and with the farmer; but for very different reasons. The land-holder flatters himfelf that by throwing his estate into large farms, he gets a few substantial tenants, able to pay their rents with regularity, instead of many, who, being less wealthy, are more irregular in their payments, and more fubject to fail. In this way too, there are fewer farmhouses, and less expence in building and repairs: besides, by thus depopulating the country, they will have fewer poor to provide for, and less poors-rate to pay.

All this is well reasoned, if there were no substantial arguments to bring forward on the other fide; whereas, there are many. A great farmer who is not extremely opulent, who is not extremely skilful, and who is not extremely prudent and industrious, is, by his over-straining exertions, much more likely to fail, than a smaller one; in which case, the landlord may lose five times the fum that he would lose by the failure of ant reserving to 12

more. In this way, therefore, the landlord runs a much greater risk, than in the other.

With respect to repairs of houses and outhouses, there may be a small faving, though not fo much, perhaps, as the landlord flatters himfelf with; for he ought to confider, that not only the house itself, but also the out houses must be proportioned to the fize of the farm; and that middle fized farms let higher in proportion than large ones, is an undoubted fact, arising from the greater number of bidders, and thereby creates an allowance for extra repairs. What I mean by midling fized farms, are those from two hundred to two hundred and fifty acres; of which, two thirds are arable. The landlord ought also to confider, that by letting his land in large farms, he is losing from off his effate a fet of frugal and industrious men, who by bringing up families upon it, make the country more populous, and increase the demand for those very provisions which are raised upon his own lands, and thus tend greatly to enhance their value, which would otherwise fall to nothing, were every country gentleman to reason so improperly. The riches of a state unquestionably consists in the number of its industrious inhabitants: the same maxim holds good with regard to every land-owner. It mul salt sensit

Farmers

Farmers are not furely the class of men, who fill the lists of the poor in any parish, or increase the rates; it is the laboring servants of the farmers and their families, who are liable to this misfortune, and who become chargeable to the community. But it is abfurd to suppose that large farms diminish the number of laboring servants: if they are worse cultivated, the number of servants will doubtless be diminished, but here the cure is worse than the disease: if they are as well cultivated the number will be nearly equal: if they are better cultivated, which is furely the object in view, then the number of servants must be increafed: and thus the rates are increased, while the contributors thereto are diminished, so that large farms cannot remedy an evil which is now become so great, and gives room for such scenes of abuse and of iniquity, that those ill contrived, and worse executed laws concerning the poor, including those of fettlements, together with the tythes as they now stand, are two of the most cruel and opressive taxes upon industry, that ever were levied, in any country, the taille in France only excepted.

Thefe are objects of legislation, which would immortalize the name of that minister, whose superiority of genius, enterprize, and fortitude, might qualify him for the glorious talk of relieving the people of this country, from burthens, far 1077

more heavy to bear, than all their other public taxes.

On the other hand, we see the farmers themfelves not a little fond of farms fo very extensive, that they are perfectly unable to manage them: this prepofterous pation in the hufbandman ought to put the land-holder greatly on his guard, for the former reasons as fallaciously upon this subject. as the latter. A larger farm, fays he, is as eafily managed, and with almost as little expence as a fmall one: being more extensive, it will no doubt, produce more; and if there be a profit on a smaller quantity, there must certainly be a greater profit on a larger. This false method of calculating, their defire of gain, their love of confequence, tempt them to venture far beyond their strength. Some neighbours of my own, with little skill, and with less capital, hold five or fix hundred acres of land and upwards, on which they should nett a clear gain of five or fix hundred pounds a year, This laid up would accumulate, and answer for every emergency, fuch as the provision for children, family diffresses, diseases, loss of live stock, or unfruitful feafons; instead of which I am well convinced, that these poor men do not save fifty fhillings, after paying rent, interest of borrowed money, the expence of culture, and family maintainance. Thus they are carried through from 27011 year

year to year, by a perfevering industry, and rigid parsimony, rolling, like Sisyphus, a stone up hill, which at every movement, is ready to recoil, and overwhelm it's laborious conductor.

But such a man is pointed out at church and fair as a great farmer, who holds six hundred acres of land, and thus his vanity is gratified, by the sacrifice of more substantial enjoyment; which is no uncommon case in all ranks of life. Such a man with a farm of one hundred and sifty or two hundred acres of land, might have sleeped sound, have lived well, paid his rent and taxes, and laid up a reserve of one hundred and sifty or two hundred pounds a year for useful purposes.

In confidering this subject, I have always calculated twenty shillings per acre of clear profit to the husbandman, after paying all expences, an allowance, I am certainly, well warranted to make, when there is no overstraining, and no other internal canker, preying on the vitals of the skilful and industrious farmer.

Every man who is minutely skilled in farming, knows, that circumstances frequently occur, from weather and otherwise, which demand immediate attention. A man who has a great extent of country in his hands, cannot at once seize that critical moment, which can be done by another, who who has no more land, than what may be easily attended

farm, can certainly give the whole a more perfect culture. Thus, Columella relates a story from Græcinus, of a farmer who having two daughters, gave the eldest at her marriage a third of his farm, and found his crops equally abundant from the remaining quantity. At the marriage of his fecond daughter he gave her another third, and still his produce continued the same.

The farmer who holds an extensive farm, treads too closely on the heels of the squire, and is thus often led to fancy himself above the consideration of more trivial objects; he is therefore apt to neglect intirely a number of useful articles, that the industrious husbandman raises on a small farm, such as sowls, eggs, hogs, butter, &c. and which he brings daily to market. In these objects of domestic care, the wife is most usefully employed, while she and her children at leisure hours are also engaged in preparing many articles for staple manufactures of the country, which she is thus able to do at a cheaper rate, than can be done by the manufacturer himself.

There is great advantage in having land well inclosed, and great beauty in having some plantations upon them, when properly disposed of. There are scarcely any extensive grounds, where some spots may not be selected for profitable as well as pleasurable pleasurable plantations; and small spots skilfully chosen, have more effect than larger plantations ill placed. I have already had occasion to mention those kinds of lands which may be cultivated to the greatest advantage in this way.

Many object to trees in hedge rows, alleging with truth, that their roots rob the plants near them of their nourifhments, and that their shade, and drops from their leaves destroy, what their roots would have spared.

These are certainly such powerful arguments against continued rows, that even I, who am a professed admirer of these noble and losty productions of nature, am obliged to surrender, by capitulating for a few straglers only, which I would most ardently wish to save, for the sake of beauty.

There is an excellent practice in this county, which facilitates my plan of retaining fome few forest trees in the hedge-rows; for, a hedge-green of twenty or thirty feet wide is generally left round our corn fields, which serves many useful purposes, and is at the same time extremely pleasant and beautiful. As this border is always in grass, it becomes firm and solid, and forms a commodious road round the field, for conveying off the produce, or bringing on the manure. It gives room for the plough horses to turn, without poaching the land, which ever way the field is plowed.

plowed. It produces both grass to cut, and pasturage for cattle, and lastly it affords a most agreeable walk for the farmer to survey all the operations of the field, and also to examine from time to time the progress and state of his crops.

The prospect of those field operations that prepare for these crops, the prospect of the thriving corn, the prospect of the yellow plenty, raise in the mind such pleasing sensations of prosperity, of the wealth of the community, and of the population, which flows from abundance, that I am not ashamed to confess, such exhilirating scenes, with all the animating reflections they inspire, have in my eyes, far superior beauties, to the most boasted exertions of art, where filent groves are reflected by artificial rivers, and whole parishes are depopulated to pale round the boundless park, in order to indulge the fullen pomp of fequestered grandeur.

Nothing can be more different than the occupations and the pleasures of the town and of the country, and when tranquility of mind and health of body are thrown into the country scale, how infinitely does it preponderate!

The charms of rural life are so beautifully defcribed by Virgil, that I hope I shall be forgiven, for transcribing the following lines from the fecond Georgic of that immortal poet.

mining the later, which ever way the field is O fortunatos

" 0	fortunatos nimium, fua fi bona norint,	. * *	
Agricola	as! quibus ipfa, procul discordibus armis,		
Fundit l	humo facilem victum justissima tellus,	460	
Si non i	ngentem foribus domus alta superbis	Mension A	
Mane fa	dutentum totis vomit ædibus undam;	4	
Nec var	ios inhiant pulchra testudine postes,		
Illufasqu	ue auro vestes, Ephyreïaque æra;		
	que Affyrio fuscatur lana veneno,	465	
Nec cal	ia liquidi corrumpitur ufus olivi ;		
	a quies, et nescia fallere vita,		
	oum varianum: at latis otia fundis,	uw agen78	
	æ, vivique lacus: at frigida Tempe,		
	fque boum, mollesque sub arbore somni	470	
Non ab	funt. Illic faltus, ac lustra ferarum,	4/5	
Et patie	ns operum, exiguoque assueta juventus,	10.5	
	um, fanctique patres! extrema per illos	ASC 117	
	excedens terris veltigia fecit.	27 10 71	
Me vero	primum dulces ante omnia Mufæ	475	
	n facra fero ingenti percuffus amore,	or the thir	
Accipian	nt; coelique vias, et sidera monstrent:	in in the	
Defectu	s folis varios, lunæque labores:	12 : 0	
Unde tr	emor terris: qua vi maria alta tumescant	L. B.E.T.	
Objicib	us ruptis, rurfusque in se ipsa residant:	480	
Quid ta	ntum Oceano properent fe tingere foles		
Hyberni	i, yel quæ tardis mora noctibus obstet.		
Sin, has	s ne possim naturæ accedere partes,		
Frigidus	s obstiterit circum præcordia sanguis;	er State of	
Rura m	ihi, et rigui placeant in vallibus amnes.	485	
Flumina	a amem, filvafque inglorius; O! ubi campi,	ncystri	
Sperchit	ısque, et virginibus bacchata Lacænis	don't	
	: O, qui me gelidis in vallibus Hæmi	CHES	
	t ingenti ramorum protegat umbra!	einide in	
ent.	LI	Felix,	

(2) (2) 10 12 12 12 12 12 13 14 15 15 15 15 15 15 15 15 15 15 15 15 15	
Felix, qui potuit rerum cognoscere causas:	490
Atque metus omnes, et inexorabile fatum	46.0
Subjecit pedibus, strepitumque Acherontis avari!	5.45,17
Fortunatus et ille; deos qui novit agrestes,	ART V
Panaque, Sylvanumque senem, Nymphasque sorores!	
Illum non populi fasces, non purpura regum	495
Flexit, et infidos agitans discordia fratres;	130
Aut conjurato descendens Dacus ab Istro:	
Non res Romanæ; perituraque regna: neque ille	E Jak
Aut doluit miserans inopem, aut invidit habenti.	spilar.
Quos rami fructus, quos ipía volentia rura	500
Sponte tulere sua, carpsit: nec ferrea jura,	
Infanumque forum, aut populi tabularia vidit.	
Solicitant alii remis freta cæca, ruuntque	6
In ferrum; penetrant aulas et limina regum:	4
Hic petit excidiis urbem, miserosque penates,	505
Ut gemma bibat, et Sarrano indormiat oftro.	
Condit opes alius, defossoque incubat auro.	
Hic stupet attonitus rostris: hunc plausus hiantem	diam'r
Per cuneos, geminatus enim, plebesque, patrumque	
Corripuit: gaudent perfusi sanguine fratrum,	510
Exilioque domos et dulcia limina mutant;	1.000
Atque alio patriam quærunt sub sole jacentem.	14.53
Agricola incurvo terram dimovir aratro;	1000
Hinc anni labor: hinc patriam, parvosque nepotes	will set
Sustinet; hinc armenta boum, meritosque juvencos.	4.50.0
Nec requies, quin aut pomis exuberet annus,	515
Aut fœtu pecorum, aut Cerealis mergite culmi:	CARL H
Proventuque oneret fulcos, atque horrea vincat.	LORGE S
Venit hyems, teritur Sicyonia bacca trapetis,	125
Glande sues læti redeunt, dant arbuta sylvæ.	520
Et varios ponit fœtus autumnus, et alte	44.2
and the second	Mitis

Mitis in apricis coquitur vindemia faxis.

Interea dulces pendent circum oscula nati:

Casta pudicitiam servat domus: ubera vaccæ

Lactea demittunt; pinguesque in gramine læto

Inter se adversis luctanter cornibus hædi.

Ipse dies agitat sestos; sususque per herbam,

Ignis ubi in medio, et socii cratera coronant:

Te libans, Lenæe vocat, pecorisque magistris

Velocis jaculi certamina ponit in ulmo;

530

Corporaque agresti nudat prædura palæstra."

I proposed to have given Dryden's translation of these beautiful lines, for the information of my English readers; but upon looking over it, although far from a literal one, yet I found the necessary adherence to antient mythology and to ancient customs, rendered it not altogether intelligible to persons unacquainted with that mythology and with those customs: I therefore flattered myself that I could, perhaps, give a better idea of the pleasures of our country life, by attempting an humble imitation of this divine poet, and, such as it is, I venture to lay it before my reader. At the same time, in justice to Dryden, I ought certainly to premise, that whatever is good in the following verses I owe to his elegant translation; whatever is defective, I am afraid, I must take upon myself.

Ah happy, if his happy state he knows,

The husbandman who plows his fertile land;

From troubles free, enjoys a sweet repose;

With food supply'd by nature's bounteous hand!

The

The princely palace, thro' whose lofty gates,
In crouds, the courtly levee bends it's way,
No envy in his breast, no wish creates,
Nor proud apartments, with profuse display.

He boasts no statues to adorn his hall,

Nor polished mirrors circled round with gold,

No figur'd tap'stry hides his homely wall,

Nor tinsel garment glitt'ring plaits unfold.

He nor to filks, nor foft brocades pretends,

Nor purple damasks of luxurious pride;

The costly spices either India sends,

Are well by healthy appetite supplied.

An easy quiet, and a safe retreat,

A harmless life, devoid of soul chicane,
And home-bred plenty the rich owner wait,
With rural pleasures sporting in his train.

Unvex'd with quarrels, undiffurb'd with noise,
In peaceful industry time glides away:
He living lakes and flowery fields enjoys,
Woods, hills, and dales, and streams that thro' them plays

And flady elms, that easy sleep invite,

And hillocks green, where milky mothers browse,

Where winged warblers in full song unite,

And golden plenty gladdens as it grows.

Here youths laborious, patient plow the ground,
Inured to hardships, and to homely fare:
While venerable age directs around,
And gives examples of productive care.

Nor are religious rites neglected here,

Nor simple morals that incite to worth;

The first of virtues, is a soul sincere,

And misery, and woescall pity forth.

Ere yet Astrea\* bade the world farewel,
'Twas here she paus'd, here sought her last retreat;
'Twas here in guiltless groves she lov'd to dwell,
And here the prints of her departing seet.

Ye facred Muses, with whose beauties fir'd,

My soul was ravished in it's earliest years;

Who, in descending life, am still inspir'd,

Ah grant your poet's last, but ardent pray'rs!

Let me on wings of science foar sublime,

Give me the ways of wandering stars to know,

Give me the secret paths of heaven to climb,

Explore her height, and depth of earth below.

Teach me the various labours of the moon,

Why flowing tides prevail upon the main,

Why oceans fwelling, burst their barriers down,

And in what dark recess they shrink again,

From whence proceed th' eclipses of the sun,
And why he speeds to shorten winter-days,
And, when his short diurnal race is run,
What cause protracts the night with long delays.

But if my heavy blood restrains the slight
Of my fond soul, aspiring to be free;
If thus precluded from the unclouded light,
Nature and nature's laws are hid from me,

\* The Goddels of Justice.

Ah then my next defire is without care,

To lead fecure, a quiet, inglorious life.

A cleanly cottage, in a cheerful air,

A pleafant country, and contented wife.

Some god conduct me to the facred strades

Where contemplation dwells, and Sylvan fong;

And O! attend ye sweet harmonious maids,

To whom soft numbers and the lyre belong.

Happy the man! whose well accomplished mind,
With bustle weary, and by fortune tried,
Can from the croud retire, nor leave behind,
The glowing ardour of a virtuous pride:

Himself possessing in an equal state,

His mind unmov'd the bribes of courts can see,

Fearless of fortune, and resign'd to sate,

He scorns their pomp, and purple flattery.

Nor hopes the people's praife, nor fears their frown,

Nor when contending parties powerful strive,

He courts not opposition, or the crown,

But prays devoutly, may the country thrive!

Without concern he hears, but hears from far,

Of tumults and descents, and distant broils;

Nor, superstitious, dreads approaching war,

From frightful signs, forboding dire turmoils.

Nor envies he the rich their treasur'd ftore,

Their splendid tables, or their costly wines;

Nor to a feeble pity for the poor,

The equal tenor of his mirth resigns.

No

No lust of wealth can tempt him from his place; The senate's mad resolves he never saw;
He never felt the courtier's foul diffgrace;  Nor heard the brawling business of the law, is about the
Some arm'd with impudence invade the court; In foreign countries others feek renown; Some to the fea, and fome to camps refort; And fome with rash profusion waste their own:
For these delight in pomp, and proud parade, has a line of these delight in pomp, and proud parade, has a line of the line of
To loll on fophas rich with velvet flower; Their guilty limbs on iv'ry beds to lay; Ill fated India groans beneath their power, Who stern, relentless, wast her wealth away,
This wretch, in earth intombs his golden flore; And broods o'er treasures ne'er to be employ'd; His great felicity to hoard up more; His greatest mis'ry lest they be enjoyed.
Some patriot speaker courts the people's praise, With solid argument, and sense approv'd. He all his powers of eloquence displays; But brib'd majorities are never mov'd.
The crafty statesman, atrogant, and vain, His power and place at stake, all arts he tries; Struggles his own importance to mantain, Though British freedom fall the facrifice.

till

From all these ills, the husbandman remote,
Calm and content, avoids debate and noise;
To useful industry directs his thought,
And feels all blessings in domestic joys:

The circling year his daily talk prepares;
By him the country markets are supply'd;
By him the town is fed, his fam'ly shares
The houshold plenty, that remains beside:

His wife, and tender children to fultain,
His willing labor he with joy beltows,
And grateful feeds his dumb deferving train,
The ox, and fleery theep, and milky cows:

Nor cease his toils, all from the loaded field

A plenteous crop of golden grain is borne;

What fertile foils, with skilful culture yield,

Not lostics harms contain the vast return!

Thus every feviral featon is employ'd,

And first, the hay fweet scented harvest brings;

And next the corn, by nymphs and swains enjoy'd;

Last the green flower, whence genial pasture springs.

The winter comes, and then the falling man,
For greedy fwine provide an ample meed,
Then oil from rape-feed runs, by mills express d,
And oily cakes the fat fing cattle feed.

Mean while his caree have intervals of ease,

His little children climbing for a kifs,

The partner of his pleasures, thrives to please your and courts his confidence, and crowns his blifs.

the

His kine with swelling udders stand prepar'd, Low for the pail, the milker's aid invite, While steers and heifers in his homestal vard. In playfome frolick, harmless battles fight.

Himself on holidays, in neat attire, Invites his neighbours to the focial glass, In gay convivial circle round the fire, In converse sweet, the chearful minutes pass.

The board is spread with diaper coarse, but clean, The produce of the wife's domestic care, Amid the guests good-natured mirth is feen, The farm supplies and full and wholsome fare.

Such is the delightful picture of the pastoral life; drawn by this masterly pencil; but laying aside the enthusiasm of the poet, let us coolly reflect on the many and great advantages, in point of health, which persons employed in agriculture, have over those engaged in other pursuits.

Many of the employments by which great numbers of people are supported, are injurious to health, by being too fedentary or too laborious; by which the powers of nature are either fuffered to languish for want of exertion, or worn out prematurely by over fatigue. But the business of hufbandry is not necessarily connected with either of these extremes. The labor is indeed constant, but not in general so violent as either to exhaust altinguide

the strength by over-straining, or to excite any debilitating discharge by perspiration. The variety likewise of the necessary business, is a savorable circumstance for those who are employed in it, as the different muscles of the body are thereby exercised, and various postures used, which contribute to strengthen the body more generally, and also to relieve the mind by a diversity of attention.

A farther advantage attending the labor of hufbandry is, that it is performed in the open air, which is in general pure and wholfome, being free from smoke and other vapours arising from inflamed bodies, and also from putrid exhalations both of the animal and vegetable kind, which are well known to taint the air in large cities, and in all manufactories, where great numbers of people are affembled in a small compass.

The furface or staple of the soil, which is the subject of rural operations, does not give out any noxious vapours, like many of the mineral or metalline substances employed in several manusactures, but is at least perfectly innocent, and has even been thought to produce effluvia rather savorable, than injurious to health. The number of vegetables likewise, with which persons concerned in such employments are generally surrounded, contribute to render the air, which is respired, pure and salubrious, by absorbing the putrid and phlogistic

phlogistic substances that float in the atmo-

The diet of persons who live in the country is, surely, in general, more wholesome than that of those who inhabit towns. Sure I am, it is more natural, and less subject to sophistication. A large portion of it consists of fresh vegetables and milk, which, though not excluded from the food of those who live in towns, are enjoyed in much greater plenty and higher persection in rural situations. These correct the putrefactive disposition of animal food, and tend to keep up the proper secretions and evacuations, and to maintain that balance in the animal system, upon which health so much depends.

The regular hours necessary to be observed by those who follow country business, are perhaps of more consequence than any of the other articles, however important those may be.

It is an old and a common opinion, that the external air is much less salubrious during the night than the day; and this opinion which was probably first drawn from observation, seems to be confirmed by chemical experiments, which tend to shew that the air exhaled from vegetables whilst the sun is above the horizon, is much more pure and fit for respiration, than that which issues from them in the absence of the sun. The ill ef-

116.1

fects of the latter are best avoided, by the human body being in a state of repose and insensibility, which makes it less liable to be affected by such impressions. The morning air, on the contrary, so celebrated both by poets and philosophers for its benign and cheering effects upon the mind and body, is enjoyed in high perfection in this way of life; and the advantages they derive from thence in regard to health, are probably very great.

Freedom from care and anxiety of mind, is a bleffing which fuch people furely enjoy in higher perfection than most others, and is of the utmost consequence. Mental agitations and corroding cares are more injurious to health, and destructive of life, than is commonly imagined; and could their effects be collected, would make no inconsiderable figure in the bills of mortality.

The simplicity and uniformity of rural occupations, which admit of no cessation, preclude many anxieties and agitations of hope and sear, to which employments of a more casual nature are subject. Nor is it the least advantage to health accruing from such a way of life, that it exposes those who sollow it to sewer temptations to vice, than persons who live in crouded society. The accumulation of numbers always augments, in some measure, moral corruption; and with regard to health, the

consequences of vice which flow from corruption,

These are the agreeable effects of rural life, up, on the health of mankind, without which blessing there can be no enjoyment; for without health, riches can purchase no pleasure; nor can power or property procure happiness.

But befides the inestimable blessing of health, what sources of pleasure every where present themselves to the philosophic mind! The country life allows of leisure for the study of books, as well as of men; and the works of nature in the animal and vegetable worlds afford boundless fields of philosophical investigation.

But the want of a country education, and a complete ignorance of country affairs, have always been confidered as infurmountable barriers, in the way of that person, who even seels in himself the strongest propensity for rural employments. But such a person ought not to be assaid, if he will study books, attend carefully to the nature of his soil, † to the operations of his neighbours, and begin his own on a small scale, extending them gradually as he gains experience.

It is again objected, that when these obstacles

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<sup>\*</sup> Dr. Falconer in Bath Soc. Trans. Vol. IV. p. 341.

<sup>†</sup> Et quid quæque ferat regio, et quid quæque recufet. Virg. Georg. Lib, I.

are removed, new and greater difficulties are to be overcome; for it is commonly alleged that no man can succeed, who is not himself over every part of the business from morning to night, and who does not perform a painful and a laborious part. This truth is confirmed by proverbial sayings, rendered sacred by their antiquity; and thus it is affirmed that

He who by the plough would thrive, Must either hold the plough, or drive.

This adage, however, is not to be taken literally; because any farmer who cultivates five hundred acres of arable land, would lose his time, in either holding or driving his plough, when he must have a great number of servants employed in a mulplicity of operations, which he should see go forward under his own eye, by transporting himself from field to field to give the necessary directions.

This idea, therefore, of an assiduous superintendance is much more correctly, as well as more elegantly expressed by Columella, when he says, "Agro empto, nist presentia domini frequens operibus intervenerit, ut in exercitu cum abest imperator, cuntta cessent officia." The farm once bought, unless the master give frequent atendance to the necessary operations, all business is at a stand, as it is with an army, in the absence of its general.

But may not this be carried still farther, and may we not ask with propriety, what manufacture, what mechanic trade, what branch of commerce can succeed, that is not overlooked by the eye, and conducted by the hand of a master?

Let us, therefore, laying prejudice aside, compare the advantages and disadvantages of the liberal and of the uneducated farmer; for advantages and disadvantages are peculiar to each.

The latter will perhaps have a superiority in an early and conftant attendance, in a perfect knowledge of detail, and of prices; of the quantity of work to be done by his fervants; of the quality of grain, &c. in a recollection of the effects of various feafons from his infancy, in an attention to the most trivial favings, and trivial gains.-He will feel great disadvantage, from having a rooted prejudice against every thing, but what he himself or his father has feen and practifed; from being unable to keep any memoranda of his transactions; or accurate accounts; from being unable to make any calculations of what his operations are to cost, and what his produce is to bring him in. This is a most important point, and makes it absolutely necessary for a farmer to know a little of arithmetic, without which he is eternally groping in the dark-Reverse this statement, and you will thus discover the advantages and disadvantages of what

I have

I have called by way of distinction the liberal farmer, who, if he adds a sufficient capital to his other superiorities is, I contend, with equal prudence and attention, in a far preserable way to his uninstructed and pains-taking competitor.

But let me be completely understood; for I by no means venture to affert, that a book-farmer is actually a good farmer, without practice and without experience; all therefore which I have advanced goes only to say, that agriculture, like all other arts and sciences is most perfectly understood, and must be followed with greatest advantages, by those who unite the theory with the practice.

After what are called the fine arts and liberal professions, says Dr. Smith, there is perhaps no trade which requires so great a variety of know-ledge and experience as agriculture. The innumerable volumes which have been written upon it, in all languages, may satisfy us that among the wifest and most learned nations, it has never been regarded as a matter very easily understood. And, a little after he adds, The direction of operations, which must be varied with every change of the weather, as well as with many other accidents, requires more judgment and discretion than any

<sup>•</sup> Usus et experientia dominantur in artibus; neque est ulla disciplina in qua non peccando discatur. Varro, Lib. I. c. 1.

of the mechanic trades, which are always the fame, or nearly fo. \*

On the one hand, therefore, the practical farmer ought not to ridicule the person who abounds most with theoretical knowledge; for if he is well founded in that, the practical part is acquirable with time and affiduity. On the other hand, the theorist should not ridicule or upbraid the practical farmer for proceeding with great caution and circumspection to any new modes of practice; for he ought to confider that fuch a man has not money to throw away in experiment, that he has a family depending on his fuccess, that what he has not been accustomed to; both he and his fervants will go about aukwardly, and that oftentimes he can neither afford the labor nor the implements required for adopting this superior practice, although he may approve of it, and be convinced of its atility: norm you have acre and bottomine

I have already pointed out the methods by which any person, about to purchase or to take a farm; may make himself acquainted with the quality of the soil he is going to engage with; but less these should appear more tedious or trouble-some than the purchaser or farmer should wish; or than time and opportunity will allow; it may be perhaps useful to suggest, that there is a more concise, but a more superficial way of judging.

Dietil

Nature and Caufes of the Wealth of Nations. B. I. c. 10.

from the appearance of the crops on the ground. If the land be poor, the crops will be thin, the straw short and the ears small; if on the contrary it be rich, the crops will be thick, the straw long, the ears large and full to the tops, and perhaps the corn will be lodged, which is a pretty sure sign of the strength of the land. Where the red weeds or poppies abound, they denote a poor light soil; where this predominate, they are the mark of a strong one. But where there is a profusion of either in arable land, it is a proof that the samer is slovenly, and the land soul.

It has been often mentioned as a rule, that when a farm is taken, three times its rent will flock and cultivate it : fome fav four times its rent. But this appears to me a very vague way of calculating, for every thing depends on the state in which the land is found. I have therefore always estimated by the acre, and my manner of computing is, that if land be clean and in good heart, three pounds per acre will fuffice to stock and to cultivate it; if clean and not in good heart it will require four pounds per acre; and if neither clean nor in good heart, five pounds per acre is the least that should be allowed. Thus two hundred acres of land, which I reckon a very good finall. farm, will require one thousand pounds to stock and to cultivate it to advantage; but at the same time, the farmer must not expect any considerable profit

profit for the first two years, after which it ought to bring a clear income of two hundred to two hundred and fifty pounds a year after paying the interest of money expended; and this I insist must be the case, wherever there is not some defect in point of rent, soil, or management.

The capital employed in agriculture, fays the very learned and ingenious Dr. Smith, not only puts in motion a greater quantity of productive labor, than any equal quantity employed in manufactures; but in proportion too to the quantity of productive labor it employs, it adds a greater value to the annual produce of the land and labor of the country; to the real wealth and revenue of its inhabitants. In all the ways, in which a capital can be employed, it is by far the most advantageous to the society.\*

I cannot close this essay to better purpose than by another quotation from this justly admired writer.

Upon equal or nearly equal profits, fays Dr. Smith, most men will chuse to employ their capitals in the improvement and cultivation of land, rather than in manufactures or in foreign trade. The man who employs his capital in land, has it more under his view and in his own power, and his fortune is much less liable to accidents,

A. R.

<sup>\*</sup> Nature and Causes of the Wealth of Nations, B. II. ch. v.

than that of the trader who is frequently obliged to commit it not only to the winds and waves, but to the more uncertain elements of human folly and injustice, by giving credit in distant countries to men, with whose character and situation he can seldom be thoroughly acquainted. The capital of the landlord, on the contrary, which is fixed in the improvement of his land, seems to be as well secured, as the nature of human affairs can admit of.

Besides, the beauty of the country, the pleasures of a country life, the tranquillity of mind which it promises, and wherever the injustice of human laws does not disturb it, the independency which it really affords, have charms that more or less attract every body: and as to cultivate the ground was the original destination of man, so in every stage of his existence, he seems to retain a predilection for this primitive employment.\*

I will therefore conclude in the language of Cicero, † "Omnium rerum ex quibus aliquid "conquiritur, nihil est Agricultura melius, nihil "uberius, nihil dulcius, nihil homine, nihil li"bero dignius."

End of Vol. II.

Les and make

<sup>\*</sup> Nature and Caufes of the Wealth of Nations, B. III. ch. i.

The Office Lib. I.

LIST of FARM-OFFICES or OUT-HOUSES necessary for a Farm of Five Hundred Acres arable, or upwards.

THREE spacious barns for wheat, for pulse, for artificial grasses.—See Vol. II. p. 220. and seq.

A drying room with a floor and flue adjoining to the wheat barn.—Vol. II. p. 22 and feq.

A straw house.-Vol. II. p. 224.

Stables for twenty work horses, if no other cattle are to be employed: but twelve horses and twelve oxen are preferable, in which case it will be necessary to have stables for twelve laboring cattle.

Harness-room, chaff-house, and corn-binn, adjoining to each stable.

Stables for three riding horses, or horses for a chaise, or jockey cart, &c. &c.

A chaife-house.

Root-house for piling of cabbages and other winter-roots.—Vol. II. p. 12. and 81, &c.

Cow house for ten or twelve milch-cows, with penns for calves.

Feeding-house for twenty or thirty cattle.

A shed for swine, with various smaller ones for fattening hogs and a separate yard.—Vol. I. p. 188.

A shed for meadow hay, with a space at the end for binding and loading a cart or waggon.

A flied for clover hay with a like space.—Vol. II. p. 408.

Houses

Houses for fowls, ducks, turkies and geefe.

A dung-stand in the yard, with a shed over it for small implements-and privies, and pit for drainage.-Vol. I. p. 192.

A work-shop for repairing implements, &c.

Sheds for waggons, carts, ploughs, rollers, harrows and other large implements.

An airy and roomy granary raised from the ground and secured from vermin.-Vol. II. p. 236. and feq.

A cool dairy and larder.

A flaughter-house.

A brew-house and bake-house.

Sheds in the yard for the protection of horses and cattle in the winter.

Sheds for two hundred sheep.

To these add a well fenced rick-yard, with stands for ricks .- Vol. I. p. 301. and feq.

A well fenced farm yard, with a pond of good water. It should be paved and sheltered from cold winds; and all the sheds for the protection of cattle and for the larger implements may be obtained by means of lean-toos to the fides of the barns, between their projecting doors, and may be fupported by posts.

A pond for the reception of the superfluous black water should be so placed, as to flood a meadow or some other field, at the proper seasons.

## LIST of the IMPLEMENTS most useful in Husbandry.

WHEEL ploughs for two horses only in the heaviest land.—Vol. I. p. 202 and seq.

Light fwing Rotherham plough. — Vol. I. p. 203, and feq.

Chiffel-shared plough, with double mould board.

The wheel plough for deep stirring.—Vol. I. p. 213, and seq.

The trenching plough for clover-lays &c .- Vol.

I. p. 211. a . I lo / - . . delege gareonris a

APPENDIX.

The flicing plough for flubbles.—Vol. I. p.

The drill-plough and horse-hoe.—Vol. I. p. 249, and seq.

The scarificator for meadows and pastures.

Vol. II. p. 344, and seq.

Heavy harrows for rough ground.

Lighter dittos for common ufe. ...... 8 .M

Lightest dittos for small feeds to the lo Transmitted

The spiky roller for clotty, land.

The plain ditto for grass lands, &c. two different weights.

Waggons and carts, with fix inch wheels.— Vol. I. p. 301.

Small mould dittos with fix inch wheels.

Jockey-

Jockey-cart, and pierced ditto for watering with black water.

The drag-rake for stubbles.

A tarpawling with blocks &c. which, if not used for building hay-ricks, is useful for covering corn, hay, or fraw fent to market. Vol. II. p. 408. to see, and see.

Scaffold for building of hay-ricks.

Chimneys for ditto .- Vol. II. p. 407, and feq. Covered trough for feeding hogs or sheep. Standing racks for ditto.

A chaff-cutter by Pyke, gue I mandanan and

Tockey

A winnowing machine.—Vol II. p. 235.

A threshing mill.—See Appendix,

A malt mill, and one for grinding barley, peafe, &c. for cattle.

Scales and weights for five hundred weight at leaffurging for meadows and pasturesteed

Standard Winchester measures, and those of the particular county where the farm is. and grant is

N. B. Besides the above, there is an infinite number of smaller, more common, but less expenfive utenfils; fuch as, harnefs, wheel-barrows, hay-forks, dung-drags, spades, shovels, mattocks, rakes, hoes, ladders, hay-cutters, cornscreens, wire-sieves, baskets, sacks, seed-cots, cradle-scythes, &c. &c. &c. 198 4 4 49 Small mould discos with fix it is n

APPENDIX.

## APPENDIX.

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THAT part of this work which treats of the threshing of corn, having been sent to the press before I received the following information, I think it may prove useful to add it here.

There are two brothers of the name of MIECKLE, who reside in Scotland, and have invented a machine for threshing, for which they have a patent. They assure us, that this invention has not been offered to the public, till repeated trials have established the certainty and perfection of its operations.

This mill may be worked by two horses, or any power of wind or water equal to that force. The work performed is twenty-four bushels of barley, or oats, in an hour; wheat and other grain in proportion:—but they do not favor us with that proportion. The corn is not only completely separated from the straw, but made ready for market, by being sisted and cleaned from the chass and other trumpery. The attendance required is that of three men, women, or boys: one to feed the mill, one to hand up the corn to the feeder, and another to remove the straw, with a boy to drive the horses.

Nn

There

A great faving, fay these gentlemen, arises from the persect clearing of the straw, which is computed by the best judges to amount to three or sour bushels an acre averagely. Any common barn will admit of the erection of this machine, as it requires only an area of ten seet square. But the large wheel, and the walk for the horses, requires a space of twenty-eight seet diameter, on the outside of the barn.

Gentlemen may either erect the machine themfelves, upon a plan and licence to be furnished by the inventors, or the inventors will contract to erect them at a fixed price.

The expence of the machine, executed in the best manner, with all the wheels of cast iron, I am informed is fixty pounds. And when the plan with instructions and licence are only furnished by the inventors, their charge is then five guineas.

Their address is, to Mr. Andrew Mieckle, at Knowsmill, by Dunbar, or to Mr. George Mieckle, at Alloa, North-Britain.

entendro es compositiva (d.). L'engantiro in troches, Boll vi successione consisse que en escribio es monte de consiste de les balloques d'anno par en La volt vi a en grand, ons cromas diferent autoria.

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